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The Public Lighting Tables of the American Meter Company will be found in the page advertisement of that Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

EDITORIALS—

Briefly Told 881

Obituary Note, Mr. Eustace C. Fitz.—The Meeting of the Incorporated Institution of Gas Engineers—Notes.

Eighteenth Annual Meeting, Western Gas Association—Official Report—Revised by the Secretary—Concluded from page 853..... 892

Natural Gas as a Pioneer for Artificial Fuel Gas, by Mr. Donald McDonald.

Synopsis of the Proceedings of the Meeting which Resulted in the Organization of the Texas Gas and Electric Light Association.... 884

Enclosure from the Secretary—Synopsis of the Proceedings—Membership—Constitution and By-Laws—Officers Elected—Afternoon Session—Adjournment.

On the Condensation and the Critical Phenomena of Mixtures of Ethane and Nitrous Oxide..... 885

Acetylene and its Enrichment Value, by V. B. Lewes, F.I.C..... 885

Manufacture and Uses of Pulverized Charcoal..... 887

Compressed Air: Its Utility and Advantages as Applied to Foundry Purposes, by Mr. H. A. Pedrick..... 888

*Lewes Apparatus for Manufacturing Gas..... 890

ITEMS OF INTEREST FROM VARIOUS LOCALITIES 891

Annual Meeting, St. Paul, Minn.—New Gas Inspector for Richmond, Va.—Moncton, N. B., Assumes Control of the Local Lighting and Water Supply Plant—Annual Meeting, Georgetown, D. C.—Resolutions to the Memory of the Late Mr. E. C. Fitz—No New Holder for the Philadelphia Works—Death of Mr. Albert E. Richmond—Extending the Use of Gas For Fuel, Johnstown, Pa.—Something from Riverside, Cal.—Gas for Fuel, Stockton, Cal.—Proposed Gas Works for Urbana, Ills.—The Monongahela Coal Company—Mr. Pearson Goes to Europe—Cheaper Gas for Clinton, Iowa—Will Chief Park Have to Go?—The San Francisco Company to Go Into Electric Light Supply—Annual Meeting, Port Hope (Ont.) Company—Moving for Cheaper Gas Rates for Newburyport and Charlestown, Mass.—And Other Items.

CORRESPONDENCE—

Mr. Egner Refers to the Discussion on Wrinkle No. 2..... 893

The Paper Awarded the Third Prize in the Cicero (Ills.) Competition..... 894

The Market for Gas Securities..... 894

BRIEFLY TOLD.

OBITUARY NOTE, MR. EUSTACE C. FITZ.—A useful temporal life was terminated, on the afternoon of May 27th, when death came to the Hon. Eustace C. Fitz, who passed over, surrounded by the family endeared to him and them by the kindliest and truest of domestic relations. Although deceased was not connected in an active sense with the profession of gas engineering, nevertheless his relations financially towards the gas supply of Boston were of such an intimate and fruitful nature, added to the further fact that one of his sons (Mr. Robert F. Fitz) is an active member of the profession, we incline to the view that a brief sketch of his career will be acceptable to our readers. Eustace C. Fitz, who was the son of Jeremiah Fitz, was born in Haverhill, Mass., on February 5th, 1833, and two years later his parents removed to Chelsea, where the greater part of his busy life was spent—in fact, he remained a resident thereof, save from 1856 to 1859, which years were spent in Cambridge, and since 1891, at which time he removed to Boston proper, occupying the home at 253 Commonwealth avenue that was his final roof tree. Neither pedigree nor luxury was the portion of deceased in his callow days, but alertness, pluck and determination were the qualities which came to him from his birthright, and these were speedily developed when, after an all too short scholastic period (spent in the public schools of Chelsea) he engaged in the fray for advancement. In 1845 he was employed by a Mr. Whitney, a prominent steel and iron factor of his day in the East, with whom he remained until 1858, thoroughly mastering the intricacies of the jobbing trade in metals. In 1858 he became a member of the firm of Farrar, Follett & Co., and in 1863 he joined the copartnership of Fuller, Dana & Fitz, which, on the retirement of Mr. Fuller, became Fitz, Dana & Co., a concern that put its impress heavily on the distribution of imported tin in America. A man of his perception and vitality naturally would be looked to for prominent appearance in the political, scholastic, religious and social affairs of the community in which he dwelt, and a glance at the records of Chelsea is enough to prove that in all of its belongings he was a potent factor. In '61-2-3 he was a member of its Council; and in '64-5-6 he was its Mayor. In '73-4 he represented one of its districts in the lower branch of the State Legislature; in '75-6 he represented it in the State Senate; in '81-2 he was a member of the Governor's Council; and later on was Chairman of the Prisons' Commission. For years he was prominent in the management of the Newton Theological Institution, of Brown University and Wellesley College, and one public monument to his memory is the Chelsea Public Library, to secure the standing of which he expended not less than $25,000. He was prominent in the Baptist faith, to the advancement of which he contributed by moral and practical support. Socially, his record is that of one who was respected, welcomed and admired by his intimates and neighbors. His connection with the gas business of Boston and its suburbs was important and pronounced, and it was always allied with the interest which meant to do and tried to do that which was best for the home holders of the capital concerned, even though his connection with the home interests only became prominent after Mr. Addicks and his associates had more than driven their entering wedge. Mr. Fitz was elected a Director in the Boston Gas Light Company, March 27, 1889, and became its Vice-President, February 10th, 1890; a Director in the Roxbury Gas Light

Company, October 12th, 1887; a Director in the Dorchester Gas Light Company, May 23d, 1889; a Director in and to the Presidency of the South Boston Gas Light Company, January 25th, 1888; and a Director in the Bay State Gas Company, May 28th, 1891. All these interests were terminated by the "quick" election held in the interest of Mr. Addicks, on or about midnight of a certain 24 hours during the last week of April last. Personally, Mr. Fitz was "big" in stature and mind and heart, which characteristics mean that he was combative only when to be otherwise would be cowardly. He was united in marriage, on January 10th, 1856, to Miss S. J. Blanchard, of Chelsea, Mass., who survives him, as do two sons and a daughter. The funeral services were celebrated at the First Baptist Church, Commonwealth avenue, Boston, the afternoon of Decoration Day, the Reverends Robert Cameron and Alvah Hovey officiating. The beautiful, impressive and simple ceremony was shared by a multitude of mourners, and the ending came in silence at the grave in beautiful Forest Hills cemetery.

THE MEETING OF INCORPORATED INSTITUTION OF GAS ENGINEERS.—The meeting of the Incorporated Institution of Gas Engineers, which was brought off in the rooms of the Royal United Service Institution, Whitehall, London, England (one has to be particular in giving a London address, for there is so much that is confusing over there, when one comes to mentioning places in the country of "cults;" for instance, in respect of the meeting place of the Institution, on this side of the water Whitehall might be mistaken for Whitechapel, which would never do, either here or there), early in May, seems to have been a most successful assembly. Mr. Carpenter presided with ability, the attendance was an average one, and it was also representative. To back all up, the weather was conducive to comfort, and the arrangements for the sessions technical, the housing of the delegates and the outing time were of a nature complementary of the weather. The paper list (it contained 10 numbers) was diversified, and its subjects were handled by their authors after the manner of writers intimate with their subjects. The autumn meeting was agreed to, and it will be held this year in Liverpool, the magnet being Mr. William King's water gas plant—and so does time its wonders work. Perhaps at the autumn meeting the gentlemen might be prevailed upon to consider the good policy of talking over the subject of reconciling their differences with the gentlemen who comprise the Gas Institute, which body concluded its 32d annual general meeting in Edinburgh last week. By this time Mr. Livesey ought to be satisfied that his "vindication" has been secured at too great an expenditure of the fraternal spirit; and even he is likely to admit, on being questioned as to the necessity that exists for two main gas engineering societies in England, that Britons are sometimes slaves to their own prejudices; in fact, it is well to remember that in forgiving others no necessity exists for forgiving oneself.

NOTES.—Mr. N. A. McClary, General Manager of the National Gas and Water Company, writing under date of the 11th inst., says that work upon the new plant of the Missouri Gas Company, of Kansas City, Mo., has been commenced. The "commencement," however, seems to have been only a bit of pipe laying, although Mr. McClary says that a plant site has been purchased and that works' construction will be proceeded with forthwith.——At the annual meeting of the Nassau Gas Light Company, of Brooklyn, N. Y., the Directors chosen were: Messrs. E. D. White, D. G. Leggett, S. T. White, Ed. Merritt and E. R. Chapman. The vacancies on the Board were not filled.——The executive management chosen by the Pawtucket (R. I.) Gas Company is: President, Lucius B. Darling; Secretary, Ed. A. Perrin; Treasurer, Charles A. Knight; Superintendent, William McGregor; Collector, George A. Stiness.——The Elizabeth (N. J.) Gas Company will extend its main system to and through the borough of Westfield, a task that means the laying of several miles of pipe.——A Toledo, Ohio, confectioner named McPhan fancied gas for fuel purposes, but did not care to pay for it, so he cut out or bye-passed a meter and the service suited him to a "T." One of Mr. Faben's inspectors, however, discovered the McPhan practice, and the confectioner was in due time brought before Police Justice Kelly. He pleaded guilty and was fined $25 and costs.——The Board of Public Works, of Louisville, Ky., has requested the Louisville Gas Company to remove the lamp posts that have been capped because of the use of arc lights for public illumination. ——Mr. E. H. Jenkins has accepted the position of Engineer and Superintendent to the Covington (Ky.) Gas Light Company, his term to commence on July 1st. Mr. James Ferrier will likely be given full charge at Columbus, where he has been for some time assistant to Mr. Jenkins. ——The Directors chosen at the annual meeting of the Newark (N. J.) Gas Light Company were: E. Vanderpool, Theo. Runyon, E. H. Wright, M. L. Ward, J. R. Emery, R. F. Ballantine, Franklin Murphy, S. H. Plum and J. P. Dusenberry. It is worthy of note that every share of the capital stock was voted, which proves that the Newark consolidation cherry is very ripe.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONCLUDED FROM PAGE 853.]

EIGHTEENTH ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT PITTSBURGH, PA., May 15, 16 and 17, 1895.

Owing to the absence of the author (Mr. Donald McDonald, of Louisville, Ky.), the following paper on

NATURAL GAS AS A PIONEER FOR ARTIFICIAL FUEL GAS

was not read. It was ordered to be printed in the official report. It was not discussed.

The above is the title for my paper exactly as it was given to me by the Secretary, and I will try to march according to orders. I would feel easier if the title was simple natural gas, as this is a subject on which almost any one can talk indefinitely, without saying anything which can be contradicted very positively. It is a most evanescent and illusive subject, as old as the hills, and, as many people remember to their sorrow, the foundation of many booms.

Natural gas proceeds from many sources, and varies greatly in its qualities. That which comes from Mother Earth consists principally of carbon and hydrogen, and is usually impregnated with vapors of petroleum. That which proceeds from "born orators" consists largely of other men's ideas, and is usually impregnated with vapors of alcohol.

Natural gas is for some reason an exceedingly humorous subject. Along with dynamite, nitroglycerine and mules' heels, it is rarely mentioned without causing that pricking up of the ears which betokens a desire to, and expectation of being called upon to smile. But this is not the vein in which I have been instructed to treat this subject, so I will attempt at once to get down to business.

Natural gas has taught thousands of people the inestimable advantages of gaseous fuel, and it is safe to say that, having once learned this lesson, they will never willingly return to the use of coal. It has demonstrated the fact that the demand for gas for fuel will be at least ten times that of gas for light, and it has also supplied the means for many thousands of very cheap experiments on gas appliances—the net result of which is, that these appliances have been improved to such an extent that people can now afford to pay 40 cents a thousand for gas where formerly they found it too expensive at 10 cents a thousand. Of course, if artificial gas had attempted to enter the field of domestic heating during the early period of these experiments, it would have been impossible either to furnish satisfaction to the consumer or profit to the company. Now, however, the case is far different. The experiments have been tried, the houses are piped, the connections made, the meters set, and more than this, the prejudices of the consumers have been overcome, and housewives have learned that a gas fire is less dangerous than a coal fire, and that it means the difference between comfort and drudgery. Any artificial gas company which had attempted to perform this pioneer work in a city as large as Pittsburgh would have lost hundreds of thousands of dollars before it had brought the matter to the favorable condition in which it now is.

It is safe to say that if natural gas were to fail to-morrow in any city where artificial gas could be had as cheap as 80 cents a thousand, that the demand on the artificial gas would immediately show a marked increase. The kitchens, the bathrooms. and, in many cases, the parlors would continue to use the gas stoves which they have already set. If artificial gas could be had as low as 60 cents, we would find added to this list many of the dining rooms, and many bedrooms which are not used as sitting-rooms. Much as has been done, however, there still remains much to be done.

In the first place, artificial gas companies must prepare themselves to sell a good clean gas for fuel at as low a figure as is consistent with a fair profit on their investments, and in arriving at this figure they must leave out of the fund, on which interest is to be paid, all reference to the fact that iron pipe once cost $100 a ton, that much of it that was laid proved to be useless, and had to be replaced, or that opposition companies have been bought out at large cost, and their works allowed to lie idle. I say that these matters *must* be left out, for the simple reason that while they are burdens on the present companies, they are not burdens on companies which may be organized, and I consider it as certain as anything in business that when natural gas fails the demand for artificial gas will be so strong that, unless it is met with an abundant supply at a low price by the old companies, new companies will be formed to meet it.

In figuring on the possibilities of cheap gas in this connection, it must be remembered that all of the items usually included under the head of cost of gas per thousand in the holder would be considerably

reduced if the output of the gas were increased tenfold, while these items which are included under the head of distribution, general expense, depreciation and management will be increased very little for the same number of consumers over what they are now; and as a consequence the cost per thousand will be very greatly cut down.

I will not say in this paper how cheap I believe it possible for a large volume of gas for fuel and light to be sold. It is a figure which will vary greatly in each locality, but I do believe that it is possible to bring the figure down so low that the wealthier class of people can afford to use gas to the entire exclusion of coal, while those not so fortunate will find a large use for it in their less constant fires.

Another question, and one not a whit less important than that of the price of the gas, is that of the fixtures through which it shall be burned. If gas at $1 a thousand is burned in a close room without any chimney, the products of combustion escaping into the room, the cost will be so small that coal will not compete with it. Many rooms are heated in just this way, and in cases where they are used for only a few minutes at a time the plan is not objectionable. Where, however, the fire is in any degree constant, and the room is not ventilated either by lowering a window or by frequent opening of the door, the walls and windows will become damp, the atmosphere will become oppressive, the health and vigor of the occupant must suffer by it, and either he or his heirs will become firm opponents of gas fuel.

I am aware that certain persons claim that such a fire, when burned in a particular patented appliance, not only does not injure the atmophere of the room, but that it actually purifies it. They even go so far as to state in a published pamphlet that a cubic foot of gas requires for its combustion 15 cubic feet of air, and that 15 cubic feet of fresh air are drawn in to take its place, forgetting entirely the fact that the nitrogen, carbonic acid and watery vapor remaining from the combustion exceed in weight, and very nearly equal in volume, the air that has been used for combustion. Forgetting also the fact that 6 feet of air will furnish sufficient oxygen to burn 1 cubic foot of coal gas.

In the same pamphlet occurs the startling statement that 6 per cent. of gas is mixed with 94 per cent. of air, thus "greatly intensifying the heat evolved." Of course every gas engineer knows that such a mixture would be too poor to explode, much less to burn. In the same pamphlet I find the no less remarkable statement that the combustion of 25 cubic feet of illuminating gas will produce only 8½ feet of carbonic acid, which amount, they say, is "of course negligible." A very little figuring will show that the amount of carbonic acid gas actually produced is nearly twice as large as stated above, and in view of the fact that most dwelling rooms contain hardly more than 2,000 cubic feet of space, one does not feel like admitting that the charging of this atmosphere with 20 feet of carbonic acid gas per hour, for 10 hours in succession, would be negligible. On the contrary, it is theoretically damnable, and practically gives a heavy, compressive atmosphere.

The fact that such advertising matter has been presented year after year to gas men, and to gas associations, without having been publicly challenged, shows how little interest gas managers have taken in this most important subject.

Among the manufacturers of gas appliances all these chemical calculations seem to have been left entirely to the sheet iron worker, and as a result we see on the market appliances for burning gas which are scientifically bad and practically still worse. Many of them have nothing to recommend them except the nickel plate and glass jewels. I do not wish to be understood as saying that all of the gas appliances have been conceived in ignorance and brought forth in indifference; on the contrary, if it were not for the rules of this Association, which forbid the mention of particular concerns, I would call attention to a cooking stove and a gas radiator which have recently appeared on the market, and which are distinct advances on all former appliances of their kind, in that they allow none of their products of combustion to escape into the rooms.

I have wandered somewhat from the subject of my article, but I consider the question of good, economical and healthful gas appliances to be the most important one connected with the general use of gas as fuel, and I do not think it possible to call the attention of gas managers too strongly to the fact. The public must necessarily look to them for guidance in this matter.

The manufacturers (human as they are) will make whatever will sell most readily, and the consumers of gas are almost invariably ignorant of its chemical composition and the scientific laws of its combustion. They have a right to look to the gas companies for guidance in this matter, and when they invest their money in a useless appliance, or when they find their health injured by the use of a badly designed one, you can be quite sure not only that the blame will rest on the gas company, but that the pecuniary loss will fall in the same place.

About one year ago I prepared a paper on the subject of "Gas for Fuel," and read it before the Ohio Gas Light Association. It contains some rather elaborate calculations of the heating effect and the products of combustion of gas fires, and to those who are interested in this part of the subject I would refer them to that paper, rather than reproduce the figures. In the same paper I have also gone over the various substances from which gas can be made and the cost per million heat units in the gas made from each of these substances, with the result that gas from naphtha will cost 30 cents for each million heat units, exclusive of labor and other items. Gas from coke will cost 19 cents per million heat units, while the gas from soft coal at $1.50 a ton will cost only 8.9 cents per million heat units. These figures leave no escape from the conclusion that when gas is made at a price low enough to be sold as a general heating agent it will be made from soft coal, and may or may not be enriched with crude oil or naphtha. Exactly by what process the gas is to be made will probably not be determined for several years to come. I believe, however, that the process which first drives off the bitumen from the coal in the shape of coal gas, and then makes water gas out of the residual coke, will be the most economical and the most convenient, especially when we remember that the only other plan is to make coal gas from the bitumen in the coal and then sell the resulting coke, tar and ammonia.

The great bulk of the capital of a gas company is, however, invested in mains, holders and meters, and the fact is plain that it is no better fixed to handle and sell coke, tar or ammonia than another concern would be with one-tenth of their investment. We are therefore driven to the conclusion that that process is best for the gas company which turns the largest proportion of the coal into gas and leaves the fewest residuals.

Another problem that natural gas has solved is the fluctuations which may be expected in the demand for fuel gas between winter and summer, and between day and night. It is not my intention to enter into this subject much in detail, but I believe from my own experience that these fluctuations are so enormous that they must be met by a large generating capacity rather than by large holders. I do not mean to say that large holders would not be an advantage, but when we remember that 10,000 consumers would call for 1,500,000 feet of gas per hour, and during intensely cold weather would keep this demand up for an average of 16 hours a day, we see that during a cold spell lasting 30 days there would be no opportunity to refill the mammoth gas holders which would be required, and that we must depend on making the gas as rapidly as it is called for, and use a pattern of generator which can be blown into service in a short time without injury, and can be left to cool down again when not required.

Another very important feature of this question is the fact that if every one depended on gas alone for heat, the consequences of a short supply would be even more disastrous than in the case of gas used for light. In bitter weather the demand is enormous, and the short supply will come at the very time when the consequences are most bitterly felt. I think it most important, therefore, that all companies supplying gas for fuel should urge their customers to keep on hand a small supply of coal and be ready to burn it in case of emergency. By doing so, the customers will not only keep warm themselves, but they will leave the gas for others who are less fortunately situated.

I am neither a prophet nor the son of a prophet, but I venture to say that a time will come when the houses will be equipped with fixtures which will burn either coal or gas. If this was done, gas at a comparatively high price would be an economical fuel in mild weather, and at all times an economical kindling for the coal. The coal, however, would be on hand when the weather had settled down to continuous cold, and would not only furnish a reliable fire for the people, but would relieve the companies from the necessity of carrying such enormous reserves. At the same time it would prevent the gas from appearing as expensive as it does when burned constantly during intensely cold weather.

Assuming that natural gas has opened a way for the general use of artificial gas as a domestic fuel, three questions arise: 1st. How will this change come about? 2d. When will it come? 3d. What can gas companies do to hasten it?

In reply to the first question, I will say that the change will come by the gradual use of artificial gas as a supplement to natural gas when the days are cold and the supply insufficient. We have already done this in Louisville with perfectly satisfactory results, and I am informed that several large natural gas companies are preparing to do the same thing in other cities.

The natural gas will gradually fail and the proportion of artificial gas sold will gradually increase, until finally the people will find that they are burning artificial gas entirely. As soon as this is shown to be profitable (which it will be), cities that never had natural gas will take it up, and, either through their present gas companies, or through opposition gas companies, will supply this demand.

As to the question of "When," it will take a great many years before gas fuel is as generally used as gas light is now. At the same time we must not lose sight of the fact that more has been done in this direction in the last three years than was done in the hundred years which preceded.

Replying to the third question, I will say that the artificial gas companies can begin selling gas for fuel at a very moderate profit, say twice the cost in the holder, exclusive of interest. In this way they would accommodate their patrons and lay the two ghosts which continually trouble their dreams, that is, "municipal control" and "the prospect of an opposition company."

Another thing they can do, and one equally important, is to take lively interest in all substantial improvements in gas burning appliances, and see that their customers get the best and the most economical.

I predict that those companies which adopt this line of tactics will come eventually to consider that natural gas has been to them a very good friend in a very complete disguise.

Synopsis of the Proceedings of the Meeting Which Resulted in the Organization of the Texas Gas and Electric Light Association.

The following is a synopsis of the proceedings of the organization meeting of the Texas Gas and Electric Light Association, for which matter we are indebted to the officers of the Association:

OFFICE OF SECRETARY, TEXAS GAS AND ELECTRIC LIGHT ASSOCIATION,
GONZALES, TEXAS, June 3, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL: At a meeting for the organization of a Gas and Electric Light Association, for Texas, held in Houston, Texas, May 22nd, 1895, I was instructed to tender your valuable JOURNAL a vote of thanks for publication of the call for preliminary meeting, etc. I also enclose a copy of the proceedings of the meeting, from which you can print anything you may think of general interest to your readers.—Respectfully, HOMER STARR, Secy.

SYNOPSIS OF THE PROCEEDINGS.

A meeting was held in Mason's Hall, Houston, Texas, on May 22nd, for the purpose of forming an Association of those connected with the gas and electric lighting interests of the State. There were present directors, superintendents and employes of the prominent lighting plants of the State and quite a number of those engaged in the gas and electric supply business located in Texas.

The meeting was called to order by Mr. W. E. Holmes, of the Austin Gas Light and Coal Company, who took the chair and proceeded to effect a temporary organization. Mr. Homer Starr, Manager of the Gonzales Electric Light and Power Company, was elected temporary Secretary.

The Chairman then stated the objects of the meeting to be:

The promotion and advancement of knowledge, scientific and practical, in all matters relating to the construction and operation of gas and electric light plants and the distribution and sale of their products.

The establishment and maintenance of a spirit of fraternity between the members of the Association by social intercourse and by friendly exchange of information and ideas on the above mentioned subject matters. And the inducement and extension of more cordial and friendly relations between the manufacturers of gas and electricity and their patrons, based upon mutuality of interests.

A Committee on Permanent Organization, consisting of Messrs. Fuller, of Calvert, Bauer, of Texarkana, and Fitzgerald, of Houston, was appointed.

The following gentlemen present then applied for membership:

W. M. Brooke, Central Electric Company, Chicago; P. Bauer, Secretary and General Manager Texarkana Gas and Electric Company; J. H. Fitzgerald, Superintendent Houston Gas Light Company; L. T. Fuller, Calvert Water, Ice and Electric Company; James T. Fuller, Calvert Engineering Company; E. F. Gibbon, Superintendent Corpus Christi Electric Light Company; W. E. Holmes, Superintendent Austin Gas Light and Coal Company; W. T. M. Mottram, Electrical Engineer, Dallas; Harry L. Monroe, General Electric Company, Dallas; J. P. Nenna, McKinney Electric Light Company; S. G. Peticolas, Houston General Electric Company; Scott Van Etten, Houston Electric Manufacturing Company; Homer Starr, Manager Gonzales Electric Light and Power Company; E. J. Sugru, Hensler Oil Company, St. Louis, Mo.

The following, not present, but who had expressed their intention of joining and had helped in getting up the movement, were also voted members:

C. D. Brann, Superintendent Trust Electric Light and Power Company, Galveston; J. R. Cullinane, Secretary Dennison Electric Light Company; J. R. Ellis, Superintendent Sherman Gas Light Company; J. L. Griffith, Secretary Waco Gas Company; J. Hicks, President Arkansas and Texas Ice and Coal Company, Marshall; A. E. Judge, President Tyler Electric Light and Power Company; H. D. Kampmann, President San Antonio Gas Company; J. C. Lord, Superintendent Fort Worth Light and Coal Company; Thos. D. Miller, Manager Dallas Gas and Fuel Company; J. D. Oliger, Secretary Cleburne Electric Light and Power Company; J. W. Ozment, President Edison Illuminating Company, Palestine; F. R. Starr, Jr., Superintendent Luling Electric Light and Power Company; J. H. Swift, General Manager Longview Electric Company.

The Committee on Permanent Organization then reported as follows:

We, your Committee on Permanent Organization, beg to make the following report:

1. That we organize the Texas Gas and Electric Light Association.

2. We recommend that the following permanent officers be elected: A President, Vice-President, Secretary and Treasurer combined, and an Executive Committee consisting of three members.

3. That our first President shall be Mr. W. E. Holmes, of Austin; Vice-President, Mr. P. Bauer, of Texarkana; Secretary and Treasurer, Mr. Homer Starr, of Gonzales.

The report was adopted as read. Messrs. Bauer, Fuller and Fitzgerald were then appointed a Committee on Constitution and By-Laws.

The subject of dues and initiation fees was then taken up. Upon motion of Mr. Fuller the Committee on Constitution and By-laws was instructed to fix the initiation fee of active members at $5 and of associate members at $2.50—which should include the dues for the first year. The regular annual dues thereafter should be $3 for active and $2 for associate members.

Messrs. Brooke, Gibbons and Mottram were appointed as a Membership Committee.

AFTERNOON SESSION.

The report of the Committee on Constitution and By-laws was then heard, and after some little discussion adopted as read.

Mr. C. D. Brann, of Galveston, and Mr. Thomas D. Miller, of Dallas, were elected members of the Executive Committee, to hold office for two years, and Mr. Fuller, of Calvert, and Mr. Fitzgerald, of Houston, were elected members, to hold office for one year.

A motion prevailed that the Executive Committee be instructed to call a meeting, if they should think it advisable, some time this summer, to pass on new applications for membership and to arrange such other things as might be necessary or convenient in preparation for the next annual meeting, which shall be held on the second Tuesday in May, 1896.

The Secretary was instructed to tender a vote of thanks to the newspapers and magazines which had kindly published notice of the intended meeting, etc.

A vote of thanks was also given Mr. Fitzgerald, of Houston, for his kindness in arranging for the meeting and for attentions shown; also to the President, Mr. Holmes, for his efforts, to which the organization of the Association is largely due.

The Secretary and Treasurer was instructed to have printed 500 copies each of the constitution and by-laws, blank applications for membership, and a circular letter of invitation and explanation. He was also authorized to purchase suitable books for the minutes, rolls and accounts of the Association, and to receive the dues and initiation fees of the members.

Mr. Fitzgerald, Mr. Fuller and Mr. Brann were appointed members of the Finance Committee.

The Association then adjourned, subject to the call of the Executive Committee.

THE Norwalk (Conn.) Tramway Company has placed the order with the Berlin Iron Bridge Company, of East Berlin, Conn., for a car barn 45 feet in width and 160 feet in length, constructed entirely of iron.

On the Condensation and the Critical Phenomena of Mixtures of Ethane and Nitrous Oxide.

At an ordinary meeting of the British Physical Society Dr. Kuenen read a paper on the subject named in the heading. He remarked that when the vapor of a pure substance is compressed at constant temperature, when a certain pressure is reached the vapor commences to condense, and the pressure remains constant until all the vapor is liquefied. If, taking the pressure and temperature as co-ordinates, the corresponding temperatures and pressures at which liquefaction takes place are plotted, the curve obtained is called the vapor pressure curve, and this curve ends at the critical temperature and pressure of the given substance. On the other hand, if a mixture of two vapors is compressed at constant temperatures, the pressure no longer remains constant while condensation is taking place, but gradually rises. The points at which condensation commences and ends lie on a U-shaped curve having its vertex turned toward the direction of increasing temperatures; such a curve the author calls a "border curve." The point at which a line parallel to the axis p touches a border curve corresponds to the critical point R of the given mixture. For all temperatures higher than that corresponding to R there is no condensation into liquid possible, while for any temperature below the critical temperature there are two vapor pressures, one corresponding to the commencement and the other to the conclusion of liquefaction. The envelope of all the border curves for mixtures containing different proportions of the two bodies is a curve, called the plait-point curve, joining the critical points of the two constituents. The point of contact P of a border curve with the plait-point curve corresponds to the plait-point on Van der Waal's thermodynamic surface. If when we go along the border curve starting from its lower branch we first reach R, then P, and if we indicate the temperatures corresponding to P and R by T_P and T_R, then for temperatures between T_P and T_R, as the pressure is increased, the quantity of the liquid first increases, then reaches a maximum, and after that decreases till it disappears. This is called retrograde condensation of the first kind, and has been observed by the author in the case of mixtures of methyl, chloride and carbon dioxide. If P, however, lies beyond R, the process of condensation for temperatures between T_P and T_R is different. In this case the volume of vapor increases, reaches a maximum, and then decreases. This constitutes retrograde condensation of the second kind. It was with a view to the experimental observation of this second kind of retrograde condensation that the author undertook his observations. A series of observations were made with each of the pure gases, and gave the following values for the critical temperature:

Ethane	32.3° C.
Nitrous oxide	36.1° C.

In the case of the mixtures the very interesting result is obtained that the critical temperafure is in some cases less than that of either of the constituent gases. Thus a mixture containing 10 per cent. of C_2H_6 has a critical temperature of 32°, the same critical temperature as for pure ethane. All mixtures containing more than 10 per cent. of ethane have a lower critical temperature than 32°, the lowest critical temperature obtained being 25.8°, and belongs to a mixture containing equal volumes of ethane and nitrous oxide.

Another important point is that the border curves do not all lie between the vapor pressure curves of ethane and nitrous oxide. Hence for any temperature there is some mixture which gives a maximum vapor pressure. It also appears from the curves given in the paper that the maximum vapor pressure is obtained with almost the same mixture at all temperatures, and that this maximum vapor pressure does not disappear with increase of temperature, but remains even up to the critical region.

For mixtures containing between 20 and 50 per cent. of C_2H_6 retrograde condensation of the second kind takes place, but the author has no been able to observe it, since the difference between T_P and T_R for the two substances experimented on cannot be more than 0.1°, and the temperature could not be maintained sufficiently constant to hope to be able to detect any phenomenon taking place over such a small temperature range.

The author showed his arrangement for stirring the liquid and vapor in the experimental tube so as to prevent any retardation of the different phases due to slow diffusion in the long narrow tubes employed. A small piece of iron with enamel beads on the ends is inclosed in the experimental tube, and by means of a small magnetizing coil which surrounds the jacket used to keep the temperature of the tube constant, this piece of iron can be moved up and down the tube so as to keep the liquid and vapor thoroughly stirred.

Professor Carey Foster and Professor Ramsey complimented the author on the very lucid way he had expounded a by no means easy subject.

Dr. Sidney Young congratulated the author on the able use he had made of his lucky discovery of two bodies such that their mixture should have a lower critical temperature than that of either of the pure substances. Professor Ramsey and he (Dr. Young) had made experiments on the vapor pressure of mixtures of alcohol and ether, and had found great difficulty in preventing the separation of the components when the volume was altered, and he could, therefore, thoroughly appreciate the utility of the author's device for overcoming this difficulty. They had also experienced considerable difficulty in filling the tube with a mixture of known composition and free from air, and he considered that when dealing with mixtures it was better to employ gases, although they could not be obtained in so perfect a state of purity as liquids on account of the greater ease with which a mixture of known composition can be obtained. The plan of making separate observations on the pure substances was a good one, and considering that the author measures the increase of pressure during the process of condensation, so that any air which happened to be present produces the maximum effect, the small rise in pressure obtained indicated a high degree of purity in the gases employed. He would like to ask the author if, in the case of mixtures, he found it possible to determine accurately the points where condensation commenced and ended, for with the alcohol and ether mixtures they had found it very difficult to determine these points. He also hoped the author would continue his observations in the direction indicated in the paper.

Mr. Inwards suggested that in the case of liquids which act on iron the iron stirrer could be inclosed in glass or india-rubber. It might also be possible to obtain more efficient stirring by means of a small fan or propeller worked by an electro-magnet rotating outside the tube.

The author, in his reply, said that when the mixtures were well stirred, the pressures at which condensation commenced and ended were well marked.

Acetylene and Its Enrichment Value.

[A paper read by Vivian B. Lewes, F.I.C., etc., before the Incorporated Institution of Gas Engineers.]

The commercial manufacture of calcic carbide by means of the temperature available in the electric furnace, has made the preparation of acetylene on a large scale a practicable possibility, and it is of manifest importance that gas engineers should know to what extent this new illuminant may be capable of aiding them in obtaining those higher illuminating values which fashion and the wisdom of Parliamentary Committees decree to be a necessity in certain places.

At the present time the question of the cheap production of aluminum is one which is occupying an enormous amount of attention; and several processes have been devised in which the electric furnace plays an important part. A Mr. T. L. Willson had devised such a process; but, being restrained by an injunction obtained by a company holding patents of a similar description, he found himself debarred from carrying on work upon aluminum. While attempting to utilize his electric furnace for obtaining the metal calcium by reducing lime with finely powdered charcoal, he found that at the temperature of the electric arc an inter-action took place, which resulted in the evolution of carbon monoxide, and left behind a fused mass which solidified to an extremely hard semi-crystalline body. Finding this was not the substance he had hoped to produce, it was thrown into the stream which gave the water power for working the dynamo; and the instant evolution of large quantities of gas attracted attention. More of the same material was then made and examined chemically, when it was found to be a body known as calcic carbide, which contains 40 parts by weight of calcium combined with 24 parts by weight of carbon, and which, upon being treated with water, gives a copious evolution of the hydrocarbon gas acetylene. On the addition of water to the calcic carbide, a double decomposition takes place; the oxygen of the water combining with the calcium, and once again forming lime, while the hydrogen unites with the carbon of the carbide to form acetylene—a gaseous compound in which 24 parts by weight of carbon are united to 2 parts of hydrogen.

The compounds called carbides had been known for a considerable period. As early as 1836, it was found that, when making potassium by distillation from an intimate mixture of potassic carbonate and carbon, a small quantity of a bye-product consisting of a compound of potassium and carbon was produced, and that this was decomposed by water with liberation of acetylene; while Wohler, by fusing an alloy

of zinc and calcium with carbon, made calcic carbide, and used it as a source from which to obtain this gas by the action of water.

Nothing more was done until 1892, when Maquenne prepared barium carbide by heating at a high temperature a mixture of barium carbonate, powdered magnesium, and charcoal—the resulting mass evolving acetylene when treated with water; while, still later, Travers made calcic carbide by heating together calcic chloride, carbon and sodium.

The calcic carbide, as produced by Willson, appearing to give promise of providing a source from which acetylene could be made on a commercial scale, experiments were instituted in America; and from there we have received details, of an extremely variable and uncertain character, as to the cost.

Calcic carbide is a dark grey substance having a specific gravity of 2.262; and, when pure, 1 lb. of it will yield, on decomposition, 5.3 cubic feet of acetylene. Unless, however, it is quite fresh, or means have been taken to carefully protect it from air, the outer surface becomes slightly acted upon by atmospheric moisture; so that in practice the yield would not exceed 5 cubic feet. The density and hardness of the mass, however, protect it to a great extent from atmospheric action; so that in lumps it does not deteriorate so fast as would be expected. But in the powdered condition it is quickly decomposed.

The acetylene prepared from calcic carbide by simply allowing water to drip upon it in a properly constructed generating vessel, when analyzed by absorption with bromine (the analysis being also checked by precipitation of silver acetylide), gives 98 per cent. of acetylene, with 2 per cent. of air, and traces of sulphureted hydrogen—the presence of this impurity being due to traces of sulphate of lime (gypsum) in the chalk used in making it, and to pyrites in the coal employed.

Acetylene is a clear, colorless gas with an intensely penetrating odor, which somewhat resembles garlic. Its strong smell is a very great safeguard in its use; as so pungent is this odor that it would be practically impossible for a leak, however small, to remain undetected. This is an important point to remember, as the researches of Bistrow and Liebreich show that the gas is poisonous, though not so deadly as carbon monoxide—both acting by combining with the hæmoglobin of the blood. The great danger of the latter gas, however, is that, having no smell, its presence is not detected until symptoms of poisoning begin to show themselves.

Acetylene is soluble in water and most other liquids, and at ordinary temperature and pressure (60° F. and 30 inches of mercury) 10 volumes of water will absorb 11 volumes of the gas; but as soon as the gas is dissolved the water, being saturated, takes up no more. Water already saturated with coal gas does not take up acetylene quite so readily; while the gas is practically insoluble in saturated brine—100 volumes of a saturated salt solution only dissolving 5 volumes of the gas. The gas is far more soluble in alcohol, which, at normal temperature and pressure, takes up six times its own volume of the acetylene; while 10 volumes of paraffin under the same conditions will absorb 26 volumes of the gas. It is a heavy gas, having a specific gravity of .91.

When a light is applied to acetylene, it burns with a luminous and intensely smoky flame; and when a mixture of 1 volume of acetylene with 1 volume of air is ignited in a cylinder, a dull red flame runs down the cylinder, leaving behind a mass of soot and throwing out a dense black smoke. When acetylene is mixed with 1.25 times its own volume of air, the mixture begins to be slightly explosive. The explosive violence increases until it reaches a maximum with about twelve times its volume of air, after which it gradually decreases in violence until, with a mixture of 1 volume of acetylene to 20 of air, it ceases to be explosive.

The gas can be condensed to a liquid at a pressure of 21.5 atmospheres at a temperature of 0° C. The liquid so produced is mobile and highly refractive; and, when sprayed into air, the conversion of the liquid into the gaseous condition absorbs so much heat that some of the escaping liquid is converted into a snow-like solid, which catches fire on applying a light to it, and burns until all the solid is converted into gas and is consumed.

In papers read before the Chemical Society in 1893, and the Royal Society in 1894-5[1], the author has shown that, when coal gas or other hydrocarbon gas leaves the jet at which it is being burnt, those portions which come in contact with the air are consumed and form a wall of flame which surrounds the issuing gas. The unburnt gas, in its passage through the lower heated area of the flame, undergoes a number of chemical changes, brought about by the action of radiant heat emitted by the flame walls, the principal of which is the conversion of the hydrocarbons into acetylene, methane and hydrogen. The temperature of the flame quickly rises as the distance from the jet increases, and a portion of the flame is soon reached where the heat is sufficiently intense to decompose the acetylene with a rapidity almost akin to detonation. The heat of its formation, thus liberated and localized by the rapidity of its decomposition, raises the nascent carbon particles to incandescence, thereby giving the principal part of the luminosity to the flame; while these particles, heated by the combustion of the flame-gases, still continue to glow until finally themselves consumed—this external heating and final combustion adding slightly to the light emitted.

Acetylene being the main factor in producing luminosity, it was to be expected that when burnt alone it would yield an exceptionally high illuminating power, and this was found to be the case.

A considerable amount of vagueness exists as to what is meant by the illuminating value of a gas, and the only assumption which can be arrived at is that it is the highest illuminating effect which can be produced from the gas without the aid of regeneration or artificial air supply other than that created by the flame itself. The proper combustion of any hydrocarbon gas, however rich, can be effected by supplying the flame with exactly the amount of air necessary to prevent smoking, and it is under these conditions that the highest illuminating effect possible with the particular burner is obtained.

With flat flames, the ratio between the air supplied and the gas consumed is governed by two factors: (*a*) The thickness of the flame; (*b*) the pressure under which the gas issues from the burner. When a gas issues from a burner under pressure the uprush of the escaping gas mechanically draws in air, so that when consuming a poor coal gas in a flat flame the pressure has to be kept down, or too much air would be dragged in, which would consume the hydrocarbons too rapidly, and so seriously affect the amount of light emitted. As the gas increases in illuminating value, more and more air is required for proper combustion; and this can be obtained by increasing the pressure at the burner.

Experience has shown that with ordinary sized flat flame burners, seven-tenths of an inch in pressure gives practically the best result with coal gas of the quality supplied in London, and up to a certain limit the same flat flame burner can be used for richer gases by increasing the pressure. When this limit is reached a thinner sheet of flame has to be employed—*i. e.*, a smaller burner used—low initial pressure resorted to, and then by increase of pressure this can be made to consume gases of increasing value, until the pressure reaches a point at which the flame becomes distorted, when a still smaller burner has to be taken. By such means as these even acetylene, with its enormously high illuminating value, can be satisfactorily consumed, while by thickening the flame and reducing the pressure to the point at which the uprush almost ceases to cause a mingling of air with the flame, and leaves the supplying of the oxygen to diffusion, even a poor gas can be made to develop its illuminating power.

On consuming acetylene from a No. 000 union jet burner at all ordinary pressures a smoky flame is obtained, but on increasing the pressure to 4 inches a magnificent flame results, free from smoke, and developing an illuminating value of 240 candles per 5 cubic feet of gas consumed. Slightly higher values have been obtained, but 240 may be taken as the average value under these conditions.

Most of these points were determined last December, and are to be found in a paper read before the Society of Arts last January. The enrichment value of the gas, however, required a long series of somewhat laborious experiments in order to insure the results being of value, and as nothing was known as to its powers of enriching, expectations as to its value could only be based on the supposition that they would at any rate be proportional to the results obtained when burnt alone, even if it did not give higher enrichment figures, as in the case of Mr. Young's oil gas.

In order to ascertain the enrichment value of the acetylene, coal gas which had been stored in a holder for some time, and which had an illuminating value of 13 candles per 5 cubic feet, was employed. This gas, from long standing, might be considered to have deposited all condensable vapors, and was used in order to prevent any question of vapor tension interfering with the results.

In determining the illuminating value of mixtures of coal gas and enrichers, too little attention is as a rule paid to several important points. Chief among these are, first, that the mixture shall be as nearly perfect as possible and free from stratification, and, secondly, that the exact percentage of the enriching gas supposed to be present is really there—this latter being especially important when gases even slightly soluble in water are being used.

In the following experiments, the method employed was to use a 5 cubic feet holder, the water of which was fairly saturated with hydrocarbons, and to run into this the 13-candle coal gas and the acetylene,

1. See *ante*, p. 147.

already roughly mixed, by passing them *pro rata* into a wash-bottle, from which they traveled on together into the holder, thus making a mixture which was to contain 10 per cent. of acetylene with 90 per cent. of coal gas. The flow of gas and acetylene into the wash-bottle was so arranged that 4.5 cubic feet of coal gas were passed through the bottle, entering it by one tube, while .5 cubic foot of acetylene passed in through a second tube.

The mixture, when made, was allowed to stand over night, in order to allow diffusion to perfect the mixture; and a long series of experiments show that this effectually prevented any stratification of the gases. The acetylene, however, being slightly soluble in water, the lower portion of the mixture in contact with the water might occasionally contain a trace less acetylene than the portion near the top of the holder. To provide against any inequality in the mixture, and also to give a check analysis, the gas was analyzed as it left the burner at the commencement of the experiments; while a second analysis was taken also from the burner at the conclusion of them—the mean of these two experiments giving the composition of the mixture dealt with.

In taking the illuminating power, Mr. Dibdin's 10-candle pentane Argand was used as the standard; and the mixture was burnt in the "London" Argand burner with a 3-inch flame. The rate of flow having been noted, the illuminating effect was calculated to a consumption of 5 cubic feet. The illuminating value was also determined in a set of Bray's "Special" union-jet burners; the richer mixtures being burnt in the sized burner which gave a slightly smoky flame at ordinary pressures—the pressure being then increased until the flame ceased to smoke. The pressure at which the test was made was duly noted.

With illuminating values up to 20 candles, the "London" Argand gave the best results. But above that, as might be expected, the flat-flame burners developed the largest illuminating power—indeed, a limit was soon reached at which it was impossible to use a 3-inch flame in the Argand. In every case, the highest illuminating value recorded—each being a mean of ten readings—was taken as the illuminating power of the mixture.

An example of one test will suffice to make this method of determination clear; and although the method is laborious, it is the only one which can be relied upon to yield results of any value.

Analysis of the Mixture.

	Commencement of Test.	End of Test.	Mean.
Acetylene	17.0	16.5	16.75
Coal gas	83.0	83.5	83.25
	100.0	100.0	100.0

Tests for Illuminating Power.

Burner Used.	Illuminating Power per 5 Cubic Feet. Candles.	Pressure. Inch.
"London" Argand	26.2	3-10ths
No. 9 Bray flat-flame	smokes	8-10ths*
9 "	32.7	12-10ths*
8 "	32.8	12-10ths*
7 "	34 3	12-10ths*
6 "	36.1	12-10ths
5 "	34.5	12-10ths
4 "	34.5	12-10ths
4 "	34.7	9-10ths
4 "	34.3	6-10ths
3 "	34.1	12-10ths
2 "	32.3	12-10ths

*Show a tendency to smoke.

Therefore a No. 6 Bray, with a pressure of 12-10ths of an inch, gives the value of mixture as 36.1; and—

$$\frac{36.1 - 13}{16.75} = 1.36 \text{ enrichment value.}$$

Working in this way, the following values were obtained:

Percentage Composition of Mixture.		Illuminating Value.		Enrichment Value of 1 Per Cent. in Candles.
Coal Gas.	Acetylene.	Coal Gas.	Mixture.	
99.10	0.90	13	13.9	1.00
97.90	2.10	13	15.1	1.00
96.00	4.00	13	17.3	1.07
95.20	4.80	13	18.4	1.12
91.00	9.00	13	23.5	1.16
89.50	10.50	13	25.3	1.17
85.00	15.00	13	33.0	1.33
83.25	16.75	13	36.1	1.36
66.90	33.10	13	60.5	1.43
55.50	44.50	13	76.7	1.43
16.70	83.30	13	175.2	1.94
00.00	100.00	..	240.0	2.40

This shows that, for small enrichments of illuminating power, acetylene has an enriching value but little better than Young's oil gas, which Mr. Glover has found in practical working to give an enrichment of 0.96 for each per cent. added. As the additions of acetylene become larger, the enrichment value gradually rises; but on plotting out the results of the experiments in a curve, the enrichment value is always found to be less than the photometric value of the gas when burnt *per se*.

These results show that acetylene will be of no practical use to the gas manufacturer for the enrichment of gas in bulk, as it can never hope to compete in price with oil gas as made by the Peebles process. They further show that the great value of the gas as an illuminant is only developed when burnt alone. There are many cases, however, in which enrichment in bulk is not continuously required, but where the gas manager would be glad of a simple and inexpensive form of apparatus which could instantaneously be started in the event of his gas unexpectedly falling below the standard.

The curious anomaly which makes an oil gas, with a photometric value of only 60 candles, develop an enrichment value of 96 candles, while a pure hydrocarbon like acetylene gives an enrichment far below that which one would expect from its photometric value, suggests many most interesting points. In a paper now being prepared, the full explanation of this phenomenon is worked out, and it supports in a remarkable way the truth of the explanation of the luminosity of hydrocarbon flames being due to the thermal changes taking place during the rapid decomposition of certain compounds.

Manufacture and Uses of Pulverized Charcoal.

The *Engineering Magazine* says that to many the statements that the manufacture of pulverized wood charcoal is an organized industry, and that this material has important industrial uses, will be new. The use of bone-black (the charcoal of bones) in refining sugar and other materials has long been practiced, and is well known to most well informed people, but that wood charcoal has analogous industrial applications of sufficient importance to require its systematic production on a commercial scale is probably not so widely known.

Carbon in the form of charcoal, whether made from bones or wood, is a powerful absorbent of substances which in many refining processes constitute the impurities it is desired to remove. Bone-black is preeminently an absorbent of gases, water and certain coloring principles. If good, freshly-calcined bone-black be exposed to the air it will absorb many times its own volume of the gases present in the atmosphere. Its attraction for water is, however, so much greater than its attraction for gases that if, after standing in air for some time, it be covered with water, the water will expel the gases, which escape with such activity through the supervening water as to give the latter the appearance of boiling; and this agitation of the water will continue till the gases have all been displaced. When bone-black is exposed to heat in a vessel or retort having an opening for the escape of the absorbed gases, the latter are also expelled, and the material is thus again fitted to act as an absorbent. It is thus that bone-black is renovated in sugar refineries, where it is used over and over again; but in this case the materials expelled in the renovating process are water and the impurities it has extracted from the syrups before the latter have been concentrated to the point of saturation. Wood charcoal has the same properties in a less degree, and it is used for purifying water, wines, glycerine and other liquid substances. *Scientific American* (April 13) devotes a page to an illustrated description of the manufacture of pulverized wood charcoal.

The lump charcoal is bought by the car-load by the manufacturer, who first extracts the gas from the coal by re-burning it in kilns, after which the material is passed through a cracking, softening and grinding process, which produces any grade of charcoal, ranging from flour to pieces as large as peas. The kilns are made of ¼-inch boiler-plate iron. They are about 10 feet in height and about 6½ feet in diameter inside, and are lined on the interior with fire-brick. Each kiln is pierced with about eighteen draught holes 4 inches in length and about 3 inches in height. A wood fire is started in the bottom of the kiln, and about two or three barrels or bags of lump charcoal placed on it. As soon as the coal becomes red-hot, a little more of the material is added, the operation being continued until the heated charcoal reaches up above the draught hole. The door of the kiln is then plastered up, the stopping of the draught below preventing the charcoal on the bottom from going to ashes and also causing it to gradually cool and retain the same form as before burning.

As fast as the fire ascends through the charcoal, fresh layers are

thrown into the kiln from the top by the attendants, the draught holes being stopped up with plaster as fast as the material becomes red-hot above each opening. The kiln holds about 70 barrels of charcoal. The top of the kiln is bricked over, with the exception of a circular opening about 2½ feet in diameter in the center. After burning for about 12 hours, a circular piece of sheet iron is placed over the opening, which smothers the fire, the gas escaping by means of a small hole in the center of the plate.

This part of the process occupies about 48 hours—from the time of firing up till the material can be cooled off and discharged from the bottom of the kiln. The coal is then cracked in a machine called the "cracker," whence it is passed to a grinding mill consisting of a runner stone revolving over a bed stone, almost exactly modelled after the old-fashioned grain mill. The ground material is screened, and the coarser particles thus separated are returned to the mill to be re-ground. Another kind of mill for grinding, used for some grades of the product, is a revolving iron cylinder containing iron balls which pulverize the material by rolling upon it. One firm in New York, engaged in this manufacture, is stated to make an output of about half a ton per hour, which is packed in bags holding about 78 lbs. each, this being the form in which it enters into industrial commerce.

Compressed Air: Its Utility and Advantages as Applied to Foundry Purposes.

[A paper read before the Foundrymen's Association, by Mr. Howard A. Pedrick, of Philadelphia, Pa.]

The advancement made in the different arts and sciences seems to have, in a measure, escaped the foundry. Mechanical skill and ingenuity have improved and greatly reduced the cost of working metals by the employment of special machinery to do a great deal of hand labor. The foundry, which is fundamental in the first process of machine construction, should be abreast in the general advancement, by bringing to its aid facilities to allow its product to be manufactured and handled just as economically as other lines. The molding machine has found favor in producing large quantities of work which formerly was only accomplished by skilled labor, but which now can be manipulated with often better results by unskilled labor. The machine molded gear wheel is another manifestation in the line of progress, producing a much superior article at a much reduced cost.

Along this line of progress and advancement we find an element, abundantly supplied, only waiting to lend its aid, when properly handled and utilized, to further our aims in reducing the cost and lessening human labor, which can then be more profitably employed in doing that which no agency can accomplish or power supply. Means and methods used to lessen physical exhaustion will generally result in a marked improvement in quality and quantity. This element we find in compressed air, which will be found a giant in strength, and at the same time a clean, safe and docile power to handle.

Considering its utility and advantages, compressed air as applied in order to lessen labor and increase the foundry's production deserves attentive study. The successful employment of compressed air in many other kinds of industries suggests that it can and should be made to serve many an operation in the foundry now performed by more expensive help. To successfully employ its agency, cost and maintenance have to be considered. The average foundry would not necessarily need to have a very extensive or costly plant. The compressor, which is the starting part of an installation, has to be considered. To avoid trouble and expensive maintenance it is desirable to obtain a machine calculated to furnish the volume of air needed with as little power as possible. Then, too, since the air will be used intermittently, the machine is better adapted if automatic in its action, thereby dispensing with any attention other than oiling. This automatic action is controlled by the variation of air pressure, causing the machine to start up when air is being used, or stopping when the desired pressure is obtained, thereby saving power, wear and tear, etc. Durability and simplicity must not be lost sight of, from the fact that around the average foundry there are not always available men to overcome any little tricks that a great many air compressors are more or less subject to. The air supplied for foundry purposes, too, must be dry, so that exhausting from a hoist or other apparatus it does not cause a miniature shower in the nature of spray. The larger types of machine often use water for cooling the air under compression in the compressing cylinder, which causes the exhaust to have the objection stated.

Cooling the air by a water jacket around the cylinder is preferable, not only from the fact of having dry air, but because it avoids the danger of water getting into the cylinder and causing its destruction. Clearance between piston and cylinder heads must be reduced to as little as possible, so as to eject all the compressed air at every stroke. Without doing so the air, necessarily heated under compression, expands and will not allow the cylinder to take in its full capacity of free air, thereby causing the machine to labor without result.

Where power is available the belt driven machine has the advantage for economy of power, because using steam in a good type of engine gives much better results than the same amount of steam used to drive a direct steam driven compressor. Then, too, the belt driven machine does not, on coming to a standstill, have to contend with water from condensation when required to start up. The belt only consumes just enough power to do the work, leaving a well regulated and economical engine to use the steam more effectively.

The air receiver or reservoir, placed in almost any out-of-the-way place, should be of liberal dimensions, as there will be times when for short periods more air will be consumed than perhaps the compressor is able to supply; but, on the other hand, there will be intervals when the supply will be more than the demand, and a large reservoir is there to receive and store it up. The receiver should not be less than 48 inches diameter by 8 feet long, double riveted and well stayed, to safely stand a working pressure of 100 pounds to the square inch. Fitted to it should be a pressure gauge safety valve, a drain cock close to the bottom and an inlet hole not less than 1¼-inch pipe. The outlet should be located at the top, as air contains considerable moisture. Taking the supply in the manner mentioned does not agitate the water which accumulates gradually in the receiver. For this reason the drain cock should be opened occasionally to free it.

The conducting pipe through the foundry should not be smaller than 1¼ inches, and every connection should be a T. If the openings thus left are not used they can be plugged up, and it will be found a good plan to arrange the pipe line so that a connection can be made without much trouble or expense. Wire wrapped ¾-inch hose, three or four ply, which is quite good enough and not expensive, is the best method of conveying the air from the pipe to the different fixtures and to the points where it is to be employed. A hose of this description, long enough to serve quite a floor area, will do better and save much time employed to do what now the molder uses his hand bellows and brush for. This fixture is similar to the common garden hose branch pipe fitted with a thumb cock, and is easily controlled; the blast of air received from it can be as mild as a breath or severe enough to blow a mold to pieces. A few such blowpipes will never get lost or misplaced, and be a convenience for those having use for such an appliance.

Foundry work necessarily entails a great amount of labor in handling materials and flasks and work of such character. Compressed air can be utilized here to very good advantage. Used for lifting flasks and drawing patterns, its elasticity rivals the most sensitive hand labor and it does its duty in a most satisfactory manner. These pneumatic hoists are commercial articles costing but little more than the ordinary chain hoists. The general construction is a cylinder fitted with a piston and rod, suspended from the top end, allowing the piston rod to have the load attached to it. They are direct acting, needing considerable height of floor for working them. The general mode of using them is to hang them from a fixed position. This does well enough for certain work; but the better and most practical way is to have them arranged on a trolley running on an overhead rail. A jib arm arranged to cover a sufficient floor area makes a fixture which can be handled and utilized with very little energy. At the same time it is more speedy than a mechanically moved apparatus for loads varying from 100 to 10,000 pounds. The height needed from floor to ceiling for overhead appliances limits the general use of the straight lift pneumatic hoist. To overcome this objection the writer has constructed a pneumatic hoist with a horizontal cylinder, and so manipulated that a much greater height of lift can be had with a very much lower ceiling. Where it is found necessary to have the hoist and load move a considerable distance beyond the practical limit of an attached hose several industrial establishments use the Westinghouse air brake coupling, which can be coupled and uncoupled very quickly. This allows the hoist to be used wherever desired. These couplings are attached to hose hanging from the pipe line about every 20 or 30 feet. In some places a drum or reel is arranged to have the conveying hose wound around it. When moving the hoist away from the reel the hose is unwound and a weight attached to a rope or cable is lifted, which winds up as the hose unwinds. As the hoist advances toward the reel again this weight keeps a tension on the hose by turning the reel in the direction necessary to wind up the superfluous hose.

The different modes of equipping the foundry with the smaller lifts

have been dealt with in a general way. The large traveling crane can be worked with compressed air as a motive power with very good results. The only change from the electric or power driven machine is placing on and driving its engines with air, and power traveling cranes can be easily made into power ones and accomplish much saving by the introduction or substitution of air power. The pneumatic system of lifting seems to be better adapted for the general run of work—that which is too heavy for one man to handle to about 10,000 pounds. The hoist requires no manual labor other than the manipulation of a small 3-way valve. The speed for lifting is variable, being entirely under the control of the operator. The workman need not wait for slow moving mechanism or for the shop laborers to lend him aid. The economy resulting from the use of pneumatic hoists is due, 1, to the reduction in time and labor required to lift the load, and, 2, the additional amount of work it enables the man to turn out.

Pursuing the subject of pneumatic lifting a little further in regard to its manipulation, the writer appreciates with what delicacy the cope of flask must be lifted from the drag to avoid injuring the mold. For this particular purpose he has in view a taper winding drum for the lifting chains to wind on, thereby reducing the speed of the lifting chains at the start and also having the effect of lowering down to slacken speed as the terminus is reached. The horizontal pneumatic hoist has some peculiar features, making it very easy to do delicate lifting. In parting a flask it is good in practice to allow the chains to have considerable slack. The operator then admits enough air to slowly start the winding drums. When the hoist encounters the frictional resistance offered, it appears for an instant to cease lifting. Here is where the elasticity of air plays its part. For after the apparent stop, the hoist gently strains on the chains until the power is enough to overcome the resistance. It lifts the cope without damage to the mold, which can then be handled as rapidly as desired.

Compressed air does not reach its full capabilities in lifting and conveying work alone; we are trying to use its force for other practical uses. Those who use the foundry's product appreciate well cleaned and pretty castings, and are often disposed to patronize the foundry which looks well after this end of the business. Some are even willing to pay a higher price where attention is given in this direction. Some few years ago the experiment of cleaning castings by the sand blast process was tried and difficulties were encountered. Steam at about 60 pounds pressure was what was then used. This wet the sand and caused frequent clogging of the pipes, and made it next to impossible for a man to stand the severe rebound of the sand. But realizing the future which the sand blast had before it led to perfecting this apparatus by the use of compressed air, thus allowing its use for bringing castings to a further degree of perfection. Ornamental and fancy castings can be thoroughly and cheaply treated in this way, producing an article which otherwise requires considerable labor to finish. In ordinary classes of work it is possible, and at the same time practical, to clean thoroughly 6 square feet per minute, no matter how much ornamentation covers the casting. Steel castings are very hard to clean ordinarily, but yield under the influence of the sand blast. The machine used for supplying the sand has the appearance of a vertical boiler, fitted with the necessary mechanism of feed valves, sand chambers, etc., so arranged that an air pressure of about 10 pounds per square inch catches the sand and delivers it through a pure rubber hose, which, on moving about, must not kink, because a sharp bend leads to the destruction of the hose by the sand. A peculiar feature of the sand blast is that it only cares to attack hard substances; anything of a soft or yielding nature stands its cutting action to a remarkable degree. In practical operation the work is accomplished by handling the hose pointed at the object in a similar manner as if playing water on it. It creates considerable dust, so that open or well ventilated places are preferable. The machine is portable, and by conveying the air supply to it it may be used almost anywhere. The application of the sand blast does not find its full utility for foundry work in the foregoing procedure alone. The writer's attention was called a short time ago to an ingenious contrivance in the nature of a tumbler or rattler, revolving on frictionless rollers, with an attachment for the sand blast nozzle. The addition of the sand blast helps to attain more thorough cleaning of smaller pieces with less tumbling.

Still hunting for further use to which compressed air can be put, why not consider the old method of chipping with a hammer and chisel, which we all know to be laborious and slow? The pneumatic chisel does vastly more and better work than several men can accomplish in in the old way. This little tool weighs about 15 or 20 pounds. It is a cylindrical piece of steel, bored out to receive the piston, which is also the hammer. A small valve, controlled by the air pressure, admits air on either end of the piston, causing it to reciprocate very rapidly and to strike a blow at every stroke. The chisel is placed on a shank projecting from the cylinder. A slight pressure of the hand holding the upper end of the tool admits air, which starts the hammer. Externally there is nothing moving; the chisel is kept in contact with the work, as if the operation were a pushing off process. The amount of work accomplished by this little air tool is surprising, and where much hand chipping is done opens a way to very materially reducing the cost and labor for such work.

In foundry practice it sometimes happens that large, heavy castings must be broken up to be returned to the cupola. A small portable drill, with compressed air for the motive power, allows several holes to be drilled into such a piece, after which a round taper steel wedge, with a few well directed hammer blows, severs the piece, which is then suitable to be handled for remelting. This little machine has sufficient power to readily drill a 1¼ inch hole, and weighs about 40 pounds. Its size and weight allow it to be used in almost any place where the air hose can be attached to it.

In almost all lines of manufacturing there are often disagreeable operations to perform, and probably one of them is the breaking of pig iron. This can all be changed where air pressure is available. The machine is quite simple in construction, being a cylinder fastened to an upright piece with a weight attached to the piston rod and a hollow anvil block at the bottom. The pig is placed on this block. A lever which controls the valve admits air under the piston, raising a weight of 300 to 400 pounds. Then by a reverse movement of the lever the air is quickly exhausted and the weight comes down, breaking the iron in the middle.

The plan of having portable sifting machines has many advantages over the belt driven machines, which are located in a fixed position and to and from which the sand is conveyed. The sand sifter, fitted with the necessary mechanism for compressed air, can be moved from place to place to perform its work, which results in the saving of time usually needed to convey many tons of sand to and fro. The machine is not unlike the ordinary power or belt driven kind; the change is to substitute air for the belt. Wire wrapped hose is the conducting pipe. Another apparatus which deserves attention is the Lucigen light, adapted for either outdoor or indoor purposes. To increase the surface and brilliancy of the flame compressed air at a pressure of from 10 to 30 pounds per square inch is generally used in conjunction with a suitable grade of oil, the air forcing the oil through a nozzle, where air and oil mingled together form a spray. When ignited this yields a large, clear flame of great illuminating power. About 1 gallon of oil per hour and 60 cubic feet of free air under pressure are required to maintain a flame of 5x30 inches, the illuminating power of this flame being reckoned at about 1,000 candles. Lamps of this character are of great service where diffused light of great power at small expense is required.

Compressed air certainly has a field of usefulness and can accomplish much with a decided saving in foundry practice.

The plant is not necessarily expensive to build or maintain. The average foundry with a plant costing from $800 to $1,500 can make a good showing resulting from its adoption.

At the conclusion of the paper some little discussion ensued. Secretary Evans said that compressed air power was being used by a large number of establishments. He had in mind a shop where it was used for a number of purposes, on sand sifters, on a machine for breaking pig iron, on cranes, and to blow the whistle. It appeared to be both economical and useful and good results were being obtained.

President Schumann stated that his company had recently put a sand blast machine in their works, and where formerly two hours were required in cleaning special castings the machine did the work in ten minutes. The only trouble with it was that the operator was trying to do everything with it, even trying to chip out the cores on 12-foot columns. They were using it on large castings to dispense with the use of facing in the sand. They were using the sand raw on castings weighing as much as 5,000 pounds to 8,000 pounds, and the castings ultimately developed a beautiful slate color; yet when they came out of the sand it would seem to be a question as to how the sand could be taken off them.

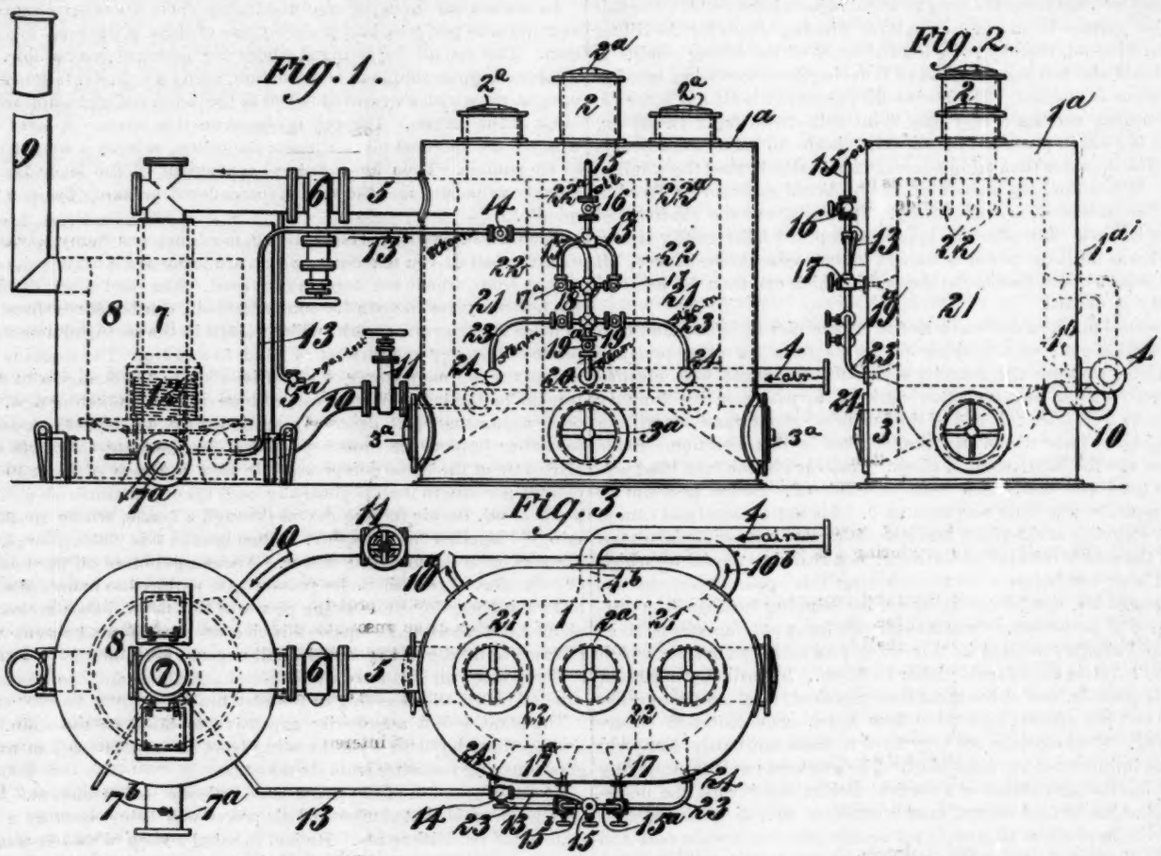
In reply to questions, Mr. Pedrick said that the best pressure to carry for the air hoists was about 80 pounds to 100 pounds. The diameters of the cylinders were based on that pressure, allowing about 25 per cent. for friction. In regard to the elasticity of the hoist, due to the pressure of the air, an instance was related of a certain machine being condemned on account of its extreme elasticity. Mr. Pedrick thought the condemned machine must have been badly constructed, and the trouble probably arose from excessive friction. Asked how the cost of compressed air compared with that of steam, Mr. Pedrick replied that steam was, of

course, cheaper where it could be utilized, but the valuable feature of compressed air was that it was a clean element to handle. With steam it was necessary to take care of the exhaust, and condensation was rapid, the result being a lift while the pressure was on.

Mr. Birkinbine believed compressed air to be practically applicable for any purpose for which steam was used as a motive power. He instanced some uses of compressed air power on a large scale, and said that Mr. Pedrick had explained the use of the same power on a small scale, and he could see no reason why there should not be a large field for it.

Lewes' Apparatus for Manufacturing Gas.

On May 7th U. S. Letters Patent (No. 538,923) were granted to Prof. Vivian Byam Lewes, of Greenwich, England, for improvements in apparatus for the manufacture of gas. Using the words of the specification:



The invention consists in certain novel features of construction and in combinations of parts more fully described hereinafter.

In the accompanying drawings, Figure 1 is a side elevation, Fig. 2 an end elevation, and Fig. 3 a plan of apparatus suitable for producing an illuminating gas from hydrocarbon oils and hydrogen according to my invention.

Referring to Figs. 1, 2 and 3, 1 is a gas generator, comprising an outer metal casing lined with refractory material and provided with inlets 2 for fuel, and outlets 3 for clinker, these openings being normally closed by doors 2*a* and 3*a* respectively. This generator 1 has the three internal chambers 21, 21, 21, formed by the two vertical partitions, 22, 22, of refractory material in the generator. These partitions are so arranged that the three chambers communicate with each other at the top only. This can be accomplished, if desirable, by a series of transverse openings 22*a* in the upper portions of the partitions.

4 is a pipe through which air can be blown into the lower end of the chamber 1 of the gas generator.

5 is a pipe with valve 6 connecting the top of the chambers 21 of the gas generator with the top of an iron fixing retort 7, which may be used in connection with the gas generator 1. This fixing retort is located within a suitable furnace or combustion chamber 8 (hereinafter referred to as the superheater furnace), having an exit flue 9.

7*a* is the outlet of the retort.

10 is a pipe provided with a valve 11 and opening into furnace 8, below the grate bars thereof and having branches 10*a* and 10*b* respectively, opening into the lower ends of the chambers 21.

12 is a steam superheating coil-like chamber or coil (hereinafter referred to as the superheater) that may be cast in the wall of the retort, or be embedded in a thick mass of iron or other suitable material to prevent its being burned. This superheater is connected with a suitable steam generator, not shown, and with a steam supply pipe 13, provided with a cock 14.

15 is a hydrocarbon supply pipe, provided with a cock 16 and with branches 15*a* and 15*b*, that are connected respectively with two injectors 17, 17*a*. These injectors may advantageously be arranged to discharge liquid hydrocarbon into the incandescent fuel in the gas generator 1, at points about midway in the height of the said gas generator as shown. The steam supply pipe 13 is connected by branches 18 with the two injectors 17, 17*a*. It is also connected by a branch 19, having a cock 19*a*, with a nozzle at 20 located near the bottom of the chamber 1 of the gas generator.

Branches 23, having cocks extend from pipe 13 or some connection thereof and having nozzles at 24, into the lower portions of the chambers 21, respectively.

The chambers 21 contain iron or a suitable compound or compounds of iron, such as sulphate of iron or oxalate of iron that is or are capable of being readily decomposed by heat into oxide of iron.

The mode of working and the action of the apparatus are as follows: Carbonaceous fuel, such as coke, is introduced into the gas generator 1 and raised to incandescence by a blast of air forced through the pipe 4 from a suitable blower. The products of combustion, largely consisting of carbon monoxide and nitrogen, are led through the iron or compound or compounds thereof in the chambers 21, and then through the branches 10*b* and 10*a* and the pipe 10 past the valve 11, which is then open, to the superheater furnace 8, the combustion of solid fuel in which is supplemented by the combustion of the carbon monoxide in the said products. By this means the fixing retort 7 and superheater 12 are heated to the required temperature, and the iron in the chambers 21, 21 will also be treated to the required temperature to decompose steam, while if the iron be present as a compound of iron it will be decomposed and reduced to the metallic state. The air blast is then cut

off, the valve 11 closed and the steam and liquid hydrocarbon supply turned on. Steam under pressure is then driven through the superheater and into the pipe 13, whence it passes through the injectors 17, 17*a*, into the incandescent fuel in the gas generator, spraying in at the same time liquid hydrocarbon, which is fed to the injectors through the supply pipe 15.

I have obtained satisfactory results by injecting hydrocarbons, such as crude petroleum and also tar, by means of steam at a pressure of about 120 pounds to the square inch, and heated to a temperature of about 400° C. By thus injecting hydrocarbon into the mass of incandescent fuel, it is "cracked" to gas, any carbon, pitch or the like that may be produced merely adding to the fuel in the gas generator, while "over-cracking" is prevented by the simultaneous generation of water-gas from the steam used in injecting. When steam is turned on through pipe 13 it also passes by branches 19 and 23 into the heated iron in chamber 21, wherein the steam is decomposed, liberating hydrogen. The gas produced in chamber 1 flows from the top thereof into the chambers 21, where it meets the currents of hydrogen generated in chamber 21. The gas thus formed flows from the top of the generator through the pipe 5, the valve 6 in which is then open, to the fixing retort 7, and this being kept at an approximately constant high temperature of, say, about 1,000° C., uniformly fixes the gas so as to produce a permanent illuminating gas. The resulting gas, owing to the dilution of hydrogen and the interactions between carbon monoxide and the nascent hydrocarbons in chamber 1, contains but a small and practically harmless percentage of carbon monoxide. Steam may from time to time be also injected through the nozzle 20 into the incandescent fuel in the gas producer 1 at a point below that at which the liquid hydrocarbons are being cracked, so that in case of over-heating and at the end of each run, or at other times as may be desired, the hydrocarbons in the gas generator may be swept out by an uprush of water gas produced by the decomposition of the steam thus injected.

To enable the fuel in the gas producer 1 to be raised to a suitable state of incandescence in a quicker and more uniform manner than has heretofore been usual, the said gas producer is or may be constructed with an air inlet 4*a*, or there may be more than one, arranged at a point or points, above the inlet 4*b* at the bottom of the gas producer, so that two or more blasts of air can be injected into the fuel simultaneously at different points in its height.

This arrangement of air blasts may advantageously be used in connection with gas producers for producing gas other than oil gas, as for example water gas.

The relative quantities of the steam and hydrocarbon admitted through the injectors into the incandescent fuel should be so regulated that the gas generated in the fuel chamber 1 shall be of a brown color. This may be determined by providing the gas pipe 5 with a jet cock 5*a* and the outlet 7*a* with a jet cock 7*b*, through either or each of which a small quantity of gas can be allowed to escape from time to time. If the gas thus allowed to escape through either jet cock be white it indicates that the hydrocarbons are not sufficiently cracked, and the proportion of steam should be reduced. If the gas be black and "sooty," it indicates that they are being over-cracked, and the proportion of steam should be increased.

The production of carbureted hydrogen continues until the temperature of the fuel in the gas generator has fallen below the required point. The supply of steam and hydrocarbon is then shut off and the various connections are adjusted as before for the passage of an air blast or blasts, any traces of hydrocarbon remaining in the said gas generator assisting the carbon monoxide to reduce to the metallic state the iron that has been oxidized in the chambers 21 by the steam, ready to repeat the foregoing operations.

The relative quantities of the steam and hydrocarbon admitted into the incandescent fuel should be determined in the manner hereinbefore explained.

I am aware that it has heretofore been proposed to produce illuminating gas from crude oil such as crude petroleum by injecting the oil by steam through red hot tubes, chambers or retorts, but this method has not been successful because the steam has injuriously attacked the oil, whereas by injecting the oil and steam into incandescent fuel, the steam attacks the incandescent carbon in the fuel in preference to the oil, with the result that a permanent gas of high illuminating value can be obtained.

When carrying out the process on a large scale, it may be made a continuous one by employing two sets of apparatus of the kind hereinbefore described, so arranged and operated that illuminating gas will be produced in one apparatus while fuel is being raised to a state of incandescence in the other, and vice versa.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT the annual meeting of the St. Paul (Minn.) Gas Light Company, the Directors elected were: Messrs. Crawford Livingston, W. R. Merriam, E. W. Winter, D. W. Lawler and Kenneth Clark.

MR. WILLIAM P. KNOWLES resigned the post of Gas Inspector for Richmond, Va., and Mr. Joseph M. Shelton has been appointed to the place. The present incumbent was a bill clerk in the Auditor's office.

A CORRESPONDENT at Halifax, N. S., forwards the following: "On June 3d, after seven years of municipal agitation and expensive arbitration and litigation, the authorities of Moncton, N. B., took over the control of the entire water, gas and electric light services of the Moncton Gas and Water Company, and started with complete municipal ownership. The bonds were sold through the London agency of the Bank of Montreal, and on the 3d inst. the city paid to the Company a check for $283,708, being the amount of the award, less $60,000 incumbrance which the city assumes. Another check for $15,000, to meet the Company's costs in the arbitration, and a further one for $5,500, to meet the value of stock in hand, etc., and other bills against the city, were also paid, making the total, less $60,000 incumbrance, $304,208. The transfer takes effect from the 1st inst."

AT the annual meeting of the Georgetown (D. C.) Gas Light Company the following officers were elected: Directors, Henry Winship, S. T. Brown, M. J. Adler, Geo. W. Cropley, William Orme, Llewellyn Nicholson and W. A. Leetch; President, Henry Winship; Secretary, Frank Leetch; Superintendent, F. G. Middleton.

THE following is a copy of the resolution passed to the memory of the late Mr. E. C. Fitz, by his associates on the Board of Directors of the Boston Gas Light Company:

"Eustace C. Fitz was a member of this Board of Directors, and its Vice-President, since 1869. He became ill in October last, and after a lingering sickness he deceased on the 27th day of May, A.D., 1895. His associates on this Board desire to place upon their records a brief testimonial of their estimate of his character and services rendered to this corporation.

"It may be said without hesitation that Mr. Fitz has for years stood in the very front rank of the business men of this city. This position he held by dint of hard work well directed, and by devotion at all times to his duty. As a result, he attained the highest distinction among his business associates for probity, loyalty and ability. His life was full of honors which came unsought, and of good deeds done without ostentation. His friends were almost numberless, and they were richly deserved by him.

"To the affairs of this corporation Mr. Fitz devoted his time and intelligence unceasingly and always with gratifying results. He was always loyal to its best interests and willing to expend any amount of time and labor in serving it. We, his fellow members, feel deeply his loss, not alone as a business associate, but as a companion and friend, whose pleasant ways and genial disposition we sincerely miss.

"*Resolved*, That the Directors of this corporation extend their sympathy to the widow and family of Mr. Fitz in their bereavement, and that the Clerk be instructed to forward to them a copy of our records in this behalf."

THE Real Estate Owners' and Agents' Association, of Camden, N. J., it is said, will bring a test suit against the Camden Gas Light Company to determine the right of the Company to refuse to furnish gas to a new tenant because a former tenant of the premises failed to settle a gas account incurred therein.

THE Finance Committee of Philadelphia Councils have declined to appropriate the sum of $300,000 asked for by the Director of Public Works, for the construction of a new holder for the Point Breeze station of the city gas works.

THE Township Committee, of Eatontown, N. J., has granted the New Jersey Consolidated Gas Company the right to lay pipes within the limits of the township.

MR. ALBERT E. RICHMOND, a respected resident of North Adams, Mass., died at his home on Quincy street, North Adams, on the evening of May 31st. He was in his 76th year, and at one time was prominent in the affairs of the North Adams Gas Light Company.

THE proprietors of the Johnstown (Pa.) Gas Company are offering every reasonable inducement to the people of that city to become users

of gas for fuel purposes. They offer to provide an additional meter without charge for measuring the fuel gas supply, the rate for the latter to be $1 per 1,000 cubic feet. The Company requires the users of stoves to run a separate line from the fuel gas meter, and agrees to perform such work at "absolute cost price." The Company, however, makes a mistake, we think, in placing the sale of gas stoves in the hands of local stove dealers and gasfitters, although the seeming error is partially righted by its declaration, "Consult us in regard to stoves, and if our local dealers do not satisfy you we will help you out." The Company announces "its intentions" in the shape of a well gotten up pamphlet, nicely illustrated, for free distribution. It goes without saying that fuel gas at $1 per 1,000 in Johnstown is more than reasonable.

THE Salinas City (Cal.) Gas and Water Company is threatened with an opposition plant to be operated by the local authorities, who allege that the existing Company's charges are exorbitant.

HERE is another sample of the fair-minded (?) spirit which governs the local authorities of the great and glorious State of California:

RIVERSIDE GAS AND ELECTRIC COMPANY,
RIVERSIDE, CAL., June 6, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL: The city voted yesterday a $40,000 bond issue for an electric lighting plant. The vote was 900 for and 153 against. When this plant is established the city will have two electric lighting plants within its limits, to say nothing of our right to operate one—a right that we have never exercised. The active electric lighting supply of Riverside is now carried on by the Paraffine Lighting Company. Under the plan proposed by the authorities the municipal plant to be established will be up to the maintaining of 100 arc lamps for public account, and a number of incandescent lamps for private account not yet determined. Riverside has a population of 6,000, and the city covers 66 square miles.—Yours very truly, J. A. MCCOLLUM, Supt." The fact that the Riverside Gas Company has not made any attempt to supply electricity is pretty good evidence that its proprietors understand the situation thoroughly; and we have no reason to doubt that it can hold its own, even in the face of the city's proposed invasion of the private lighting field. Another thing that will force itself upon the average observer's attention is that Riverside's 6,000 ought not to have ground for complaint on the score that the square mileage of their city is insufficient to afford them plenty of room.

THE proprietors of the Stockton (Cal.) Gas and Electric Company have agreed to sell gas stoves to their consumers at cost, to keep a complete line of cookers, heaters, etc., on display in their office, to set a separate meter for gas used for fuel, and to allow a discount of 12½ per cent. from the net illuminating rate on gas used for cooking and heating purposes.

C. H. BRAMPTON, of Chicago, has applied to the authorities of Urbana, Ills., for a franchise to build and operate a gas works. He proposes to sell gas for fuel at $1 per 1,000 cubic feet, the rate for gas used for illumination to be $1.25 per 1,000. Urbana is the capital of Champaign county, Ills., and is on the Indianapolis, Bloomington and Western Railroad, at a point about 50 miles east by south of Bloomington. The Illinois Industrial University is located there, and its population numbers about 4,700.

THE Pittsburgh (Pa.) *Leader* says that the Monongahela Coal Company, of which General Dodge is President, will take possession of and develop a 40,000 acre tract of coal land, commencing at the Monongahela city line and extending to the Ten Mile Village, all in Washington county, Pa. This bed is probably the richest undeveloped coal territory in the region. Capt. John F. Dravo, for 20 years President of the Coal Exchange, has re-embarked in the coal business as General Manager for the Monongahela Company, and will have charge of the development of the field. The product is a steam and gas coal, and lies in a 9-foot working vein.

MR. W. H. PEARSON, Manager of the Consumers Gas Company, Toronto, sailed from New York, on Wednesday last, by steamer Britannic, for Europe. Mr. Pearson will pass some time on the Continent, and expects to return to the land of the free towards the end of August.

THE Economical Gas Apparatus Construction Company is completing a contract for the Blackburn (England) Corporation Gas Works, which calls for the erection of two sets of the Company's improved water gas apparatus, up to a producing capacity of 1,000,000 cubic feet per diem.

EVEN if Mr. Highlands, of Clinton, Ia., did say some sharp things about Welsbach lamps at the Pittsburgh meeting of the Western Association, and although he did seem to lean a trifle towards electricity, it is also a fact that since his return to Clinton he has issued the following circular to the residents of that bustling borough:

OFFICE OF CLINTON GAS LIGHT AND COKE COMPANY, CLINTON, IA.

"For the benefit of private consumers this Company has made several valuable concessions, one of which is the reduction in price of gas from $1.75 to $1.25 per 1,000 cubic feet. This only to take effect in private residences using gas for both illuminating and fuel purposes through one meter, and using 1,000 feet or over of gas each month. This applies to old as well as new consumers. For new customers requiring services, this Company will run the service from the main to the curb free of cost, and will finish the service as well as pipe the house at prices named elsewhere. To get the full benefit of the reduced rate it is necessary to use 1,000 feet of gas each month, as all consumers having a consumption of less than 1,000 feet will be charged at the rate of $1.75 per 1,000. From this it will be seen that the consumer using 1,000 feet per month pays the same as does the consumer using 700 feet per month, resulting from the difference between the two rates." Other extracts from the circular are: "There are now used in Clinton over 375 gas stoves and ranges. Each individual one of this amount is giving perfect satisfaction. See your neighbors who use one and hear what they say about it. Use a gas stove so as to save time. Use one to keep cool as well as to keep warm; use them to cut down the expense of your light. * * * Gas fitting has always been expensive. This has kept many families from using gas as an illuminant. We will run gas services at the rate of 10 cents per foot (free to the curb.) You can have your house piped at 8 cents per foot. The same pipes can be used for both fuel and illuminating purposes. We will sell you a stove, run your service and pipe your house in 30, 60 or 90 days' time. This puts gas within the reach of all. * * * Gas prices: For fuel uses, $1.25 per 1,000 cubic feet, net; for illuminating use, $1.75 per 1,000 cubic feet, net; for both fuel and illuminating purposes, in residences only, and where 1,000 feet or over is used each month, $1.25 per 1,000 cubic feet, net. Gas services at 10 cents per foot; gas fitting in residences, 8 cents per foot; chandeliers and fixtures at wholesale rate; gas stoves are guaranteed, and range in price from $2 to $45."

THE users of incandescent electric lights in the Rye and Portchester districts of New York are very indignant over an increase of 25 per cent. in the selling rate recently instituted by the proprietors of the Consolidated Gas and Electric Light Company.

THAT chronic office seeker who now fills the place of Mayor of Philadelphia (Mr. Warwick), it is said, has demanded the resignation of Mr. William K. Park, Chief Engineer of the municipal gas works. This proceeding is grossly unjust, for the Mayor charges Mr. Park with having allowed the works to run down, whereas the annual reports of the Chief show that for years his appeals for appropriations to pay for betterments vitally needed for the works have been systematically and consistently ignored. For instance, elsewhere in our items for the week will be found a statement to the effect that last week the finance committee of Philadelphia Councils refused to appropriate a sum of money for the construction of an additional holder at the Point Breeze station, and while the pettifoggers of the Council seem to know nothing about the need for this storage vessel, the gas engineers of the country, who are conversant with the physical condition of the works, are wondering over the motives which prompt the stupidity that witholds the money for so self-evident an addition to the Philadelphia plant. Chief Park is a competent engineer, and has served the city with zeal and faithfulness for a quarter of a century. In fact, considering the obstacles that hampered him, his management of the plant was remarkably successful, and we raise our voice in emphatic protest against the injustice which it is proposed to do him.

WE regret to say that the proprietors of the San Francisco Gas Light Company have determined to go into the business of electric lighting and power supply on an extensive scale. President Crockett is now East arranging for the machinery, and we believe the cost of the plant when completed will be something like $2,000,000.

WE are indebted to a correspondent at Montreal for the following: The 37th annual meeting of the Port Hope Gas Company, of Port Hope, Ont., was held on May 29th, the President (J. Smart, Esq.) in the Chair. The Secretary and Treasurer, Mr. Gray, read the statement of the year's receipts and expenses as duly audited. The President, in moving the adoption of the account, which was seconded by Mr. McLennan, said: The result of our year's business for year ending 31st

March, is not quite as good as that of the previous year, largely caused by the general commercial depression, the burning of Trinity School (now being rebuilt), and a loss on sale of two cars of coal tar to a firm now in liquidation, with whom for years we have had similar dealings. In consequence our dividend has been reduced to 4 per cent. as against 4½ per cent. of last year; another proof that gas companies, with limited field and output, are hardly the mines of wealth the public some years ago insisted they were, as instanced by unsatisfactory results, so far as the shareholders are concerned, of our own Company and those in our adjacent towns of Cobourg and Lindsay—the former having been sold out some time ago at one-half its cost, and the latter at 25 per cent. and now defunct. The recent advance in the price of coal oil will doubtless have the effect of increasing the use of gas as an illuminant and for summer cooking. Engineers and inventors have now turned their attention towards producing greater lighting efficiency from gas consumed. Already much has been done in that direction, and doubtless greater results will follow. The recently introduced incandescent gas burner, now in use in Mr. Williamson's store since last Christmas, known in Canada as the Auer light, and in the United States as the Welsbach burner, is an instance. It gives a steady white light of great diffusive power, giving, for the same gas burnt, about double the illumination of the old gas burner. It is light produced by the heat of gas acting upon a cone above the gas burner, giving a perfectly steady, brilliant service at a much reduced cost to the consumer. The present demand for these burners has been unprecedented. In the United States they are largely displacing the electric incandescent lamp wherever they are introduced, and the manufacturers have orders in advance for all they can supply. The Company continues to sell gas stoves and fixtures at wholesale cost and freight. These gas cookers are a marvel of cleanliness and comfort in warm weather, instantaneous in their service. The finger regulates them to the required efficiency. No coal to carry in, or ashes to be got rid of, and all this at a reasonable cost. If you want your wife or daughter to be comfortable, cheerful and happy in the dog days, order in a gas cooker without delay. It may be of interest for you to know that our sales to private consumers during the past eight years of electric light competition have materially increased. As in 1887, the last year of gas street lighting, our gas output was:

To private consumers.....	1,888,000
Estimated for street lamps.....	393,000
Total.....	2,281,000

Whilst during the past year we sold to private consumers only 2,235,100 cubic feet. On motion of Mr. Wm. Craig, seconded by Mr. J. H. Helm, the following resolution was unanimously passed: "That the thanks of the shareholders are hereby tendered to the Board of Directors and officers for their efficient management of the Company's affairs during the past year." Messrs. G. M. Furby and J. H. Helm were reappointed Auditors, and the old Board of Directors re-elected. At a meeting of the newly elected Board, held immediately after, John Smart, Esq., was unanimously chosen President and Managing Director for the ensuing year.

THE Washington (D. C.) Gas Light Company will construct a holder on the square bounded by 12th and 13th, and M and N streets.

THE City Council of Newburyport, Mass., has requested Mayor Gurney to take the necessary steps under the State law to secure a reduction in the selling rates of the Newburyport Gas and Electric Company.

THE Charlestown (Mass.) Improvement Association is also moving for an order obliging the Charlestown Gas and Electric Company to reduce the rates charged by it. The average price received per 1,000 by this Company for the year ended June 30th, 1894, was $1.46. We might also say that Agent Neal favors a reduction, and that some sort of a concession will be made this summer.

THE Municipal Gas Company, of Albany, N. Y., will, for the next three years, light the Executive Mansion and Capitol Building with gas and electric lights, for the sum of $30,000 per annum.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Egner Refers to the Discussion on Wrinkle No. 2.

NO. 91 GRANBY ST., NORFOLK, VA., June 11, 1895.

To the Editor AMERICAN GAS LIGHT JOURNAL: As the writer could not attend the Pittsburgh meeting of the Western Gas Association, and hence could not in person respond to the criticisms of his contribution to "Wrinkles," sent at the solicitation of Mr. Thompson, and published on page 848 of the AMERICAN GAS LIGHT JOURNAL for June 10th, perhaps you will give the author an opportunity to say a few words on the subject in the columns of the JOURNAL. By-passing what Mr. Humphreys said with only this remark, that, in the writer's opinion, it was a perfectly fair statement, I will now go on to what Mr. Miller is reported to have said. In reply to his first question, I would state that the cost of the meter repairs at the works where the writer has been reemployed since January, 1894 (having been with the same Company about 17 years ago the first time), was, for the twelvemonth ending the 1st inst.—1.12 per cent. of what the total cost of the meters used would be now at the present prices. The reader may make his own comments upon that showing. No new meters were bought, except to supply increased consumption, and no unrepaired meters are in stock.

To the second question I am, happily, able to reply also; though I doubt that many gas companies make the test Mr. Miller suggests, excepting the ordinary one, "known to everybody," like some other things to which Mr. Miller calls attention.

Our storage capacity is much in excess of our greatest daily output—it is nearly 70 per cent. more than that to date—hence I have had an excellent opportunity to test what per cent. of our gas is fixed and have arrived at it in the following simple manner: I have filled one of the three gasholders with gas and let it stand for days, yes, for two weeks at one time, without appreciable loss in bulk or illuminating power. Neither do we get any oil in our drips at the holders or in the streets; and our unaccounted-for gas, which was 12.69 per cent. the year before taking charge of these works, was only 3.28 per cent. for the past year.

As to the point whether anthracite or coke is better for making water gas, not only my own experience has taught me, but everyone with whom the writer has conversed upon that subject, and who may have had experience with it, agreed that, *weight for weight, retort house coke was much the better of the two.* It gives the men a little more work to do, and they naturally prefer the anthracite, whence sometimes the statement that it is better than *retort house* coke; but the fact stated remains. As to the insinuations of the critic about blowing hard enough, etc., I think I can afford to by-pass "them," without loss of reputation. Now about the apparatus: The writer superintended his first water gas apparatus in the summer of 1882. This was a double set of the so-called Granger-Collins types of Lowe water gas apparatus, and it had about 17 cubic feet of superheater space to each square foot of grate surface in the generators. The following summer the writer designed, erected and operated (and it was successfully operated for over four years afterward) what was, perhaps to this date, the largest single water gas cupola in the world. The inside diameter of the generator was 15 feet 9 inches. This apparatus had but 12.7 cubic feet of fixing chamber space to each square foot of grate surface. The double superheater Lowe improved water gas apparatus, which was the one referred to in the contribution to the "Wrinkles," was erected here in the summer of 1892, and though not before, it gave general and entire satisfaction after we got hold of it; and the slight improvement mentioned merely added to its other good qualities.

Now, this apparatus has a total of about 34 cubic feet of fixing chamber capacity to the square foot of grate in the generator. The superheater proper alone has about 20 cubic feet to the square foot of grate surface. As we never had any trouble to fix our gas in the first mentioned apparatus, and, as stated, the second seemed to give satisfaction for a term of years, the writer now submits to the practical reader if it was not reasonable to suppose that we could occasionally by-pass the carburetor, when we still had more fixing chamber space to square foot of grate left than either of the other apparatus had in toto; and if it was, after all, such an unheard-of, rash, ill-judged thing to do as described in the contribution referred to, especially when practice demonstrated the soundness of the writer's position in the matter.

Finally, the writer trusts that he is too long and well known to the members of the Western Gas Association, and to the readers of the AMERICAN GAS LIGHT JOURNAL as well, to require any assurance on his part that in presenting anything for publication he is not entirely serious and sincere, or, for that matter, ignorant of the subject presented. His object is, and always was, to give of his experience, as he has received from that of many others, the best information obtainable; and Mr. A. S. Miller's remark, "Not to take Mr. Egner seriously," was, in the writer's opinion, ill-timed and uncalled-for; since a simple statement of facts was made, which any thinking, practical and unprejudiced gas man could not fail to understand, upon reflection, after carefully reading the article in question. Very respectfully,

FREDERIC EGNER.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,
PROPRIETORS.

MONDAY, JUNE 17, 1895.

The Paper Awarded the Third Prize in the Cicero (Ills.) Competition.

By MAUD MICHIGAN.

[The following is the text of the paper which was awarded the third prize in the competition instituted by the proprietors of the Cicero (Ills.) Gas Company for the best original article descriptive of the merits of cooking by gas. For the conditions of the competition see JOURNAL, May 27, p. 773.—ED.]

From my point of view, the greatest advantage derived from using gas as a fuel is the quickness in obtaining results.

How easily and expeditiously a tempting oyster stew can be made, or a cup of tea or coffee when you come in, tired and cold, from a long ride or walk in the evening, or from the theater; and how altogether delightful such an impromptu little luncheon is, although not strictly conforming to the best hygienic laws. It could not be prepared on a coal range in twice the time.

Then if baby has convulsions in the night, or papa is awakened by a soreness in his lungs, or if, in the season of green vegetables and unripe fruit, the children should have chanced to evade your watchful eye and indulged too freely, you have only to strike a match and in five minutes the hot water bag is ready, or the hot drink or the warm flannels, as the case may necessitate.

There is absolutely no dirt connected with a gas range or gas grate. A stiff whisk broom is indispensable in the furniture of a gas range, to be used in brushing the burners thoroughly at least semi-weekly. This takes out the dust which accumulates when sweeping, and any grease or sticky substance that may get into them by reason of food stewing over or spilling. When brushing the burners the dirt falls on the dust pan underneath, which is easily removed, cleaned and replaced. There are no ashes to take out of a gas range, no coal and wood to carry, and no temper to ruffle if the wind is not in just the right direction, or the kindling wood damp and the fire refuses to light or burn up satisfactorily. You strike a match—the gas does the rest. You can always depend upon having a steady, even heat, greater or less, as you regulate the burners. If you are boiling or cooking anything on the top burners, you can bring it to the boiling point in a few moments, and then turn down the burner so as to keep it at the same temperature, and go about your other work with the consciousness that your food is neither scorching nor cooling on account of the heat being too intense or too slow.

The cost of using gas as a fuel, with proper management, amounts to no more than coal and wood bills, and if the housewife's comfort and happiness is taken into consideration, there is no comparison in the prices. The same heat used for one article in the oven can be utilized for a number of purposes. Potatoes and different side dishes can be cooked in the oven at the same time the meat is roasting; and if the dessert is to be a hot pudding it can go in at the same time, and almost the entire meal be prepared with the same heat.

While there is nothing nicer than a perfectly made bed of coals for broiling purposes, how many ordinary cooks or housekeepers are able to prepare such? It is a hard matter for anyone but professional cooks to get the coal fire just at the right state, at just the right time, to put on the meats. It is apt not to be hot enough, or to go down before the meat is cooked; but on a gas broiler all this is obviated, as when the broiler is heated and the meat put to cook there is an even heat distributed all over the surface, and it so remains until the steak has been turned and re-turned, and cooked just to the right degree, which a little practice will soon determine. There is no taste or smell of the gas whatever in the food.

The Market for Gas Securities.

Consolidated sold as high as 149, ex-div., this week, and the opening was made in it to-day (Friday) at 148. Possibly the maximum level for the summer has been reached, but we look for it to reach 160 before the 1st of January. All other city shares are strong, notably Equitable and Standard. The Brooklyn situation is somewhat disturbed, the agitation being caused by the attitude of the Nassau Company, whose shareholders, however, have admitted to their Board a member of the dominant party favoring consolidation. We note a sale at auction of 84 shares Nassau at 227. The stock is a purchase in the neighborhood of 225. As we said would be the case, Governor Morton signed the Wray bill, and its beneficial effect will soon be manifest. Chicago gas enjoyed an old-time see-saw during the week, selling down to 71¼, and up (to-day) to 76⅜. Lacledes are uneven, and Milwaukee gas is 64 bid. Baltimore Consolidated is a trifle better, current quotations being 62⅜ to 62½. Detroit bonds advanced 12 points for the week. Cincinnati sold at the very high price of 205¼ this week, and the franchise mongers of Syracuse have not been able to break the price of Syracuse gas. Consumers, of Jersey City, is strong, at 80 bid.

Gas Stocks.

Quotations by Close & Nash, Brokers and Dealers in Gas Stocks.

35 WALL ST., NEW YORK CITY.

JUNE 17.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$35,480,000	100	148	148¼
Central	500,000	50	140	..
" Scrip	220,000	..	100	..
Equitable	4,000,000	100	200	..
Bonds, 6's	1,000,000	1,000	..	..
" 1st Con. 5's	2,300,000	1,000	111	112
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	172	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	.
Northern	150,000	50	90	91
" Bonds	150,000	1,000	..	98
New York and East River	5,000,000	100	31	33
Preferred	2,000,000	100	56	58
Bonds	3,500,000	1,000	95	95½
Richmond Co., S. I.	348,650	50	50	..
" Bonds	100,000	..	..	..
Standard	5,000,000	100	64¾	66
Preferred	5,000,000	100	107	..
Bonds, 1st Mortgage, 5's	1,500,000	..	105½	..
Yonkers	.....	50	101x	.
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	125	..
Citizens	1,200,000	20	65	..
" S. F. Bonds	320,000	1,000	..	101
Equity	2,000,000	10	..	..
" Bonds	1,000,000	..	..	..
Fulton-Municipal	3,000,000	100	175	..
" Bonds	300,000	..	103	..
Peoples	1,000,000	10	90	.
" Bonds, 7's	368,000	..	100	..
" " 6's	94,000	..	98	100
Metropolitan	870,000	100	170	..
" Bonds, 5's	70,000	..	..	..
Nassau	1,000,000	25	225	..
" Ctfs.	700,000	1,000	99	100
Williamsburgh	1,000,000	50	210	..
" Bonds	1,000,000	..	107	110
Out-of-Town Companies.				
Bay State	5,000,000	15	..	24
" Income Bonds	2,000,000	1,000	35	..
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	81¾	81¾
2d " " "	3,000,000	1,000	58½	59½
Buffalo Mutual	750,000	100	120	..
" Bonds	200,000	1,000	95	100
Chicago Gas Co.	25,000,000	100	76¼	76⅝
Chicago Gas Lt. & Coke Co.				
Guaranteed Gold Bonds	7,650,000	1,000	93	93½
Columbus	1,069,000	..	..	..
1st Mortgage	1,085,000	..	..	..
Consumers, Jersey City	2,000,000	100	80	..
" Bonds	600,000	1,000	90	..
Cincinnati G. & C. Co.	7,000,000	100	205	205¼
Consumers, Toronto	1,800,000	50	184½	187
Central, San Francisco	.....	..	90	100
Capital, Sacramento	.....	..	..	50
Consolidated, Baltimore	11,000,000	100	62⅝	62¾
Mortgage, 6's	3,600,000	..	107	107½
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,400,000	..	..	..
Detroit	4,000,000	..	29	..
" Con. Bonds	4,812,000	..	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	74	..
" Bonds	2,000,000	..	84	..
Hartford	750,000	25	190	198
Indianapolis	2,000,000	..	140	..
" Bonds, 6's	2,650,000	..	104	..
Jersey City	750,000	20	180	..
Lafayette Gas Co., Ind.	1,000,000	100	86	87
Bonds	1,000,000	1,000	86	88
Louisville	2,570,000	50	..	130
Laclede, St. Louis	7,500,000	100	33½	33¾
Preferred	2,500,000	100	85	..
Bonds	9,084,400	1,000	97⅛	97¼
Little Falls, N. Y.	50,000	100	..	100
Bonds	25,000	..	..	100
Montreal, Canada	2,000,000	100	200	..
New Haven	.....	25	225	..
Oakland, Cal.	.....	..	42⅝	43
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	2,100,000	1,000	..	108
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	..	175
Paterson, N. J.	.....	25	99	102
Rochester Gas & Elec. Co.	2,150,000	50	..	..
Preferred	2,150,000	50	81	..
Consolidated 5's	2,000,000	..	87½	90
Syracuse, N. Y.	500,000	25	..	..
San Francisco, Cal.	10,000,000	100	72⅝	72¾
Washington, D. C.	2,000,000	20	250	..
Western, Milwaukee	4,000,000	100	64	66
Bonds, 5's	3,556,000	..	92½	93½
Wilmington, Del.	500,000	50	188	190

Advertisers' Index.

GAS ENGINEERS.

	Page
Jos. R. Thomas, New York City	916
Wm. Henry White, New York City	915
Fred. Bredel, Milwaukee, Wis.	911
H. C. Slaney, Brooklyn, N. Y.	915
Geo. R. Rowland, New York City	915
The Western Gas Construction Co., Fort Wayne, Ind.	906
Humphreys & Glasgow, New York City	902
T. G. Lansden, St. Louis, Mo.	915

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md.	913
United Gas Improvement Co., Phila., Pa.	905
Burdett Loomis, Hartford, Conn.	914
National Gas and Water Co., Chicago, Ills.	907
Economical Gas Apparatus Construct'n Co., Toronto, Ont	919
The Western Gas Construction Co., Fort Wayne, Ind.	906
A. M. Sutherland, New York City	899

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City..... 916
Continental Iron Works, Brooklyn, N. Y..... 914
Deily & Fowler, Phila., Pa..... 916
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 912
Stacey Mfg. Co., Cincinnati, Ohio..... 915
Bartlett, Hayward & Co., Baltimore, Md..... 913
Davis and Farnum Mfg. Co., Waltham, Mass..... 912
R. D. Wood & Co., Phila., Pa..... 914
Isbell-Porter Company, New York City 914
Fred. Bredel, Milwaukee, Wis..... 911
United Gas Improvement Co., Phila., Pa..... 905
Berlin Iron Bridge Co., East Berlin, Conn..... 902
National Gas and Water Co., Chicago, Ills..... 907
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 919
The Western Gas Construction Co., Fort Wayne, Ind.... 906
Humphreys & Glasgow, New York City..... 902
Gas Engineering Co., Pittsburgh, Pa..... 899

SCRUBBERS AND CONDENSERS.

G. Shepard Page's Sons, New York City..... 915
R. D. Wood & Co., Phila., Pa..... 914
James R. Floyd & Sons, New York City 916
Continental Iron Works, Brooklyn, N. Y..... 914
Gas Engineering Co., Pittsburgh, Pa..... 899

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 913
Fred. Bredel, Milwaukee, Wis..... 911
J. H. Gautier & Co., Jersey City, N. J..... 911
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 910
Adam Weber, New York City 910

TAR AND CARBONIC ACID EXTRACTOR.

G. Shepard Page's Sons, New York City..... 915

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich..... 896
G. Shepard Page's Sons, New York City..... 915
Gas Engineering Co., Pittsburgh, Pa..... 899

GAS METERS.

John J. Griffin & Co., Phila., Pa..... 920
American Meter Co., New York and Philadelphia..... 919
The Goodwin Meter Co., Phila., Pa..... 918
Helme & McIlhenny, Phila., Pa. 919
D. McDonald & Co., Albany, N.Y..... 919
Nathaniel Tufts, Boston, Mass..... 918
Maryland Meter and Mfg. Co., Baltimore, Md..... 918
Metric Metal Co., Erie, Pa..... 917

GAS AND WATER PIPES.

Ohio Pipe Co., Columbus, Ohio 917
M. J. Drummond, New York City..... 917
R. D. Wood & Co., Phila., Pa..... 914
Warren Foundry and Machine Co., New York City..... 917
Donaldson Iron Co., Emaus, Pa..... 917
Addyston Pipe and Steel Co., Cincinnati, O..... 916
John Fox, New York City..... 917

GAS BAGS.

Peerless Rubber Mfg. Co., New York City..... 896

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, New York City..... 911

GAS COALS.

Penn Gas Coal Co., Phila., Pa..... 909
Perkins & Co., New York City..... 908
Despard Gas Coal Co., Baltimore, Md..... 909
Westmoreland Coal Co., Phila., Pa..... 909
Shaner Coal Co., Philadelphia, Pa..... 396
Berwind-White Coal Mining Co., New York and Phila... 908
Henry C. Scheel, New York City..... 909

CANNEL COALS.

Perkins & Co., New York City..... 908
Log Mountain Coal, Coke and Timber Co., Pineville, Ky. 909
The Goff-Kirby Coal Co., Cleveland, O..... 908

GAS ENRICHERS.

Standard Oil Co., New York City..... 909
The Sun Oil Co., Pittsburgh, Pa..... 909
W. H. Townsend, New York City..... 909

COKE CRUSHER.

C. M. Keller, Columbus, Ind..... 909

CONVEYING MACHINERY.

C. W. Hunt Company, N. Y. City..... 900

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 896

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City. 907
Wilbraham Baker Blower Co., Phila., Pa..... 907
Isbell-Porter Co., New York City..... 914

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Company, New York City 914
Continental Iron Works, Brooklyn, N. Y..... 914
G. Shepard Page's Sons, New York City..... 915

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J..... 910
B. Kreischer & Sons, New York City..... 910
Adam Weber, New York City 910
Laclede Firebrick Mfg. Co., St. Louis, Mo..... 910
Cyrus Borgner, Phila., Pa 910
James Gardner, Jr., Pittsburgh, Pa..... 910
Henry Maurer & Son, New York City 910
Baltimore Retort and Firebrick Co., Baltimore, Md..... 910
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 910
Brooklyn Firebrick Works, Brooklyn, N. Y..... 910
F. Behrend, New York City..... 900

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N. Y..... 910
F. Behrend, New York City 900

INCANDESCENT GAS LAMPS.

Welsbach Light Co., Gloucester, N. J..... 899

MICA GOODS.

The Mica Mfg. Co., New York City..... 896

BURNERS.

C. A. Gefroerer, Phila., Pa..... 914
Moses G. Wilder, Phila., Pa..... 896

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 896

GAS TUBING.

New York Gas Tubing Co., New York City..... 896

STREET LAMPS.

J. G. Miner, Morrisania, New York City..... 911
Bartlett Lamp Mfg. Co., New York City..... 911

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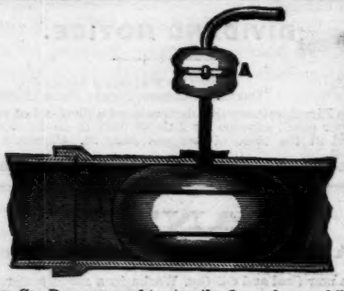

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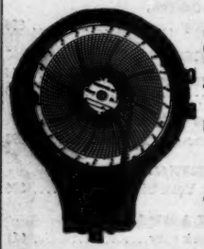

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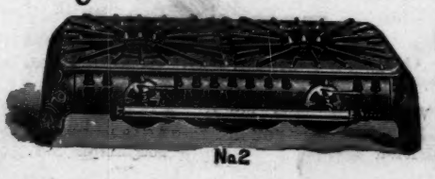

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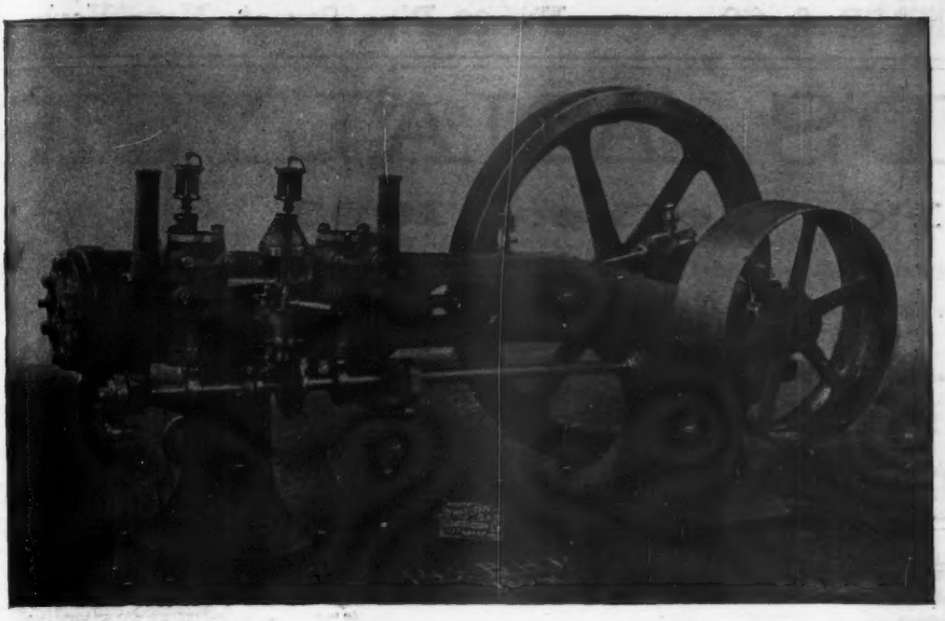

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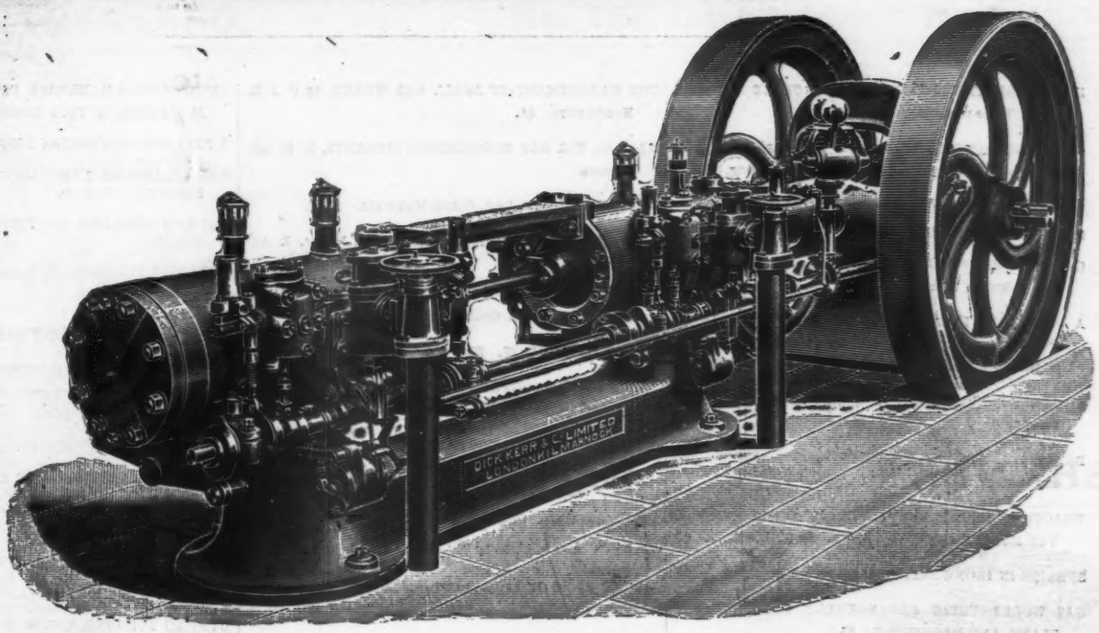

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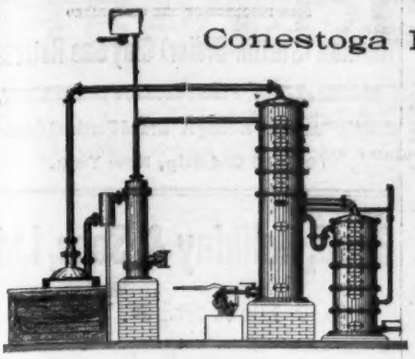

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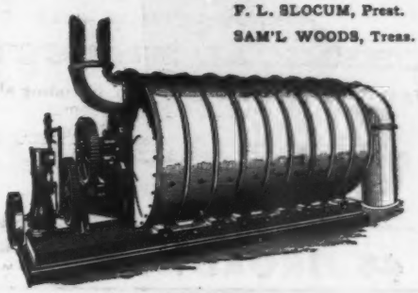

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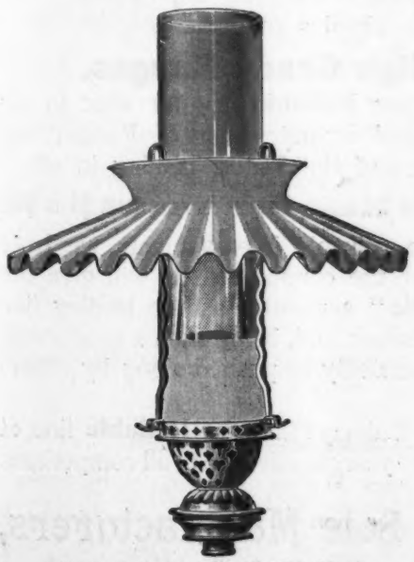

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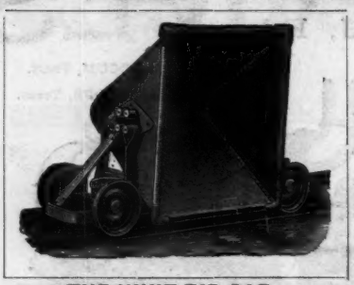

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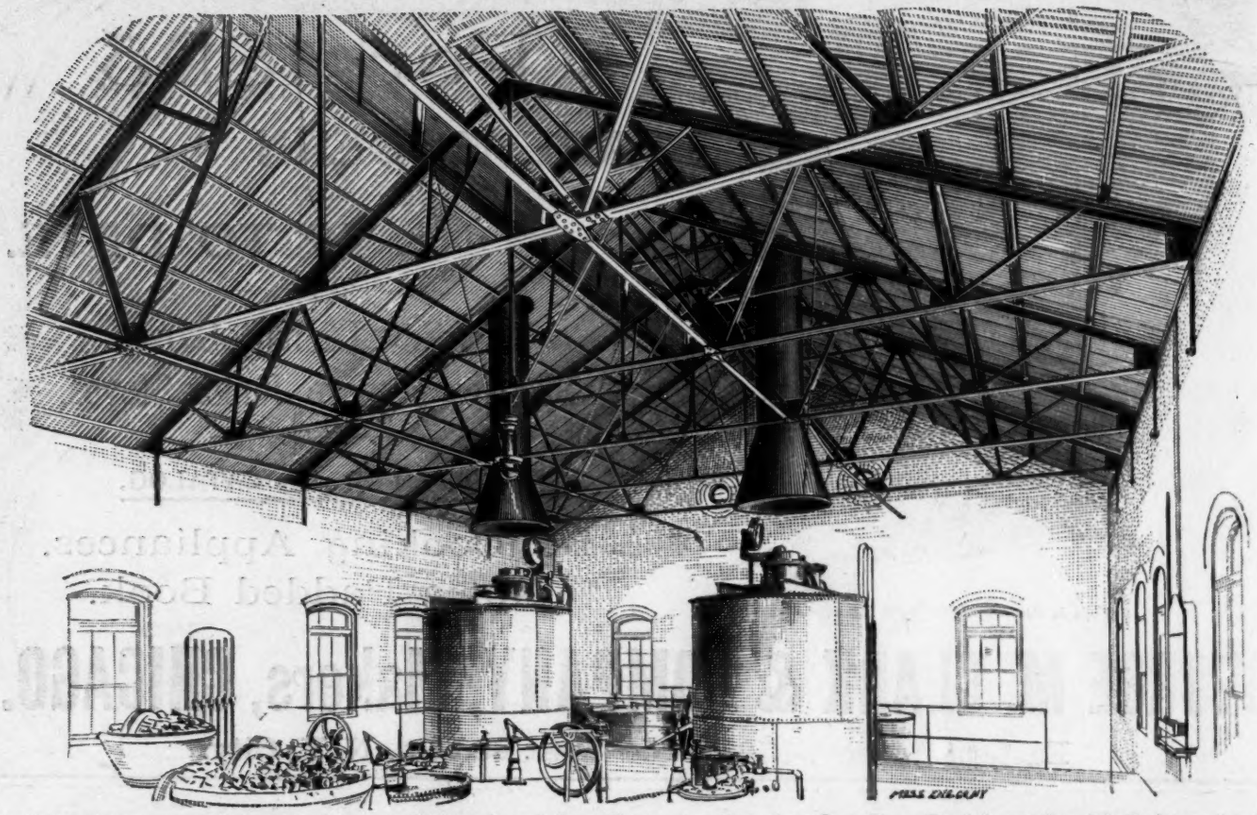

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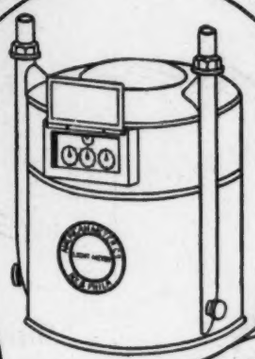

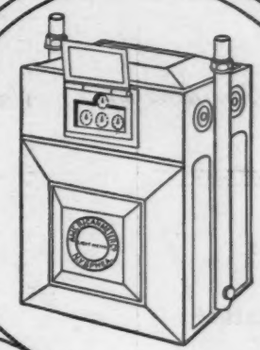

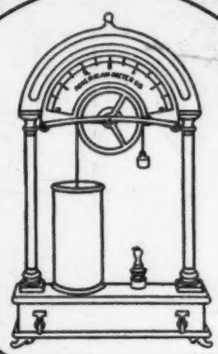

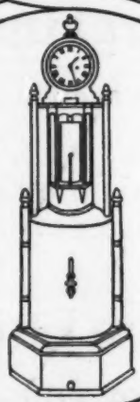

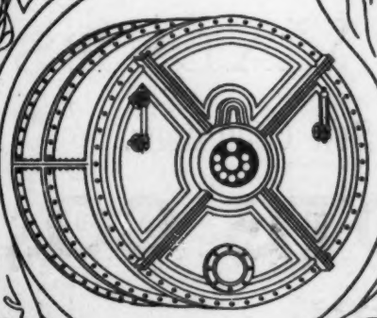

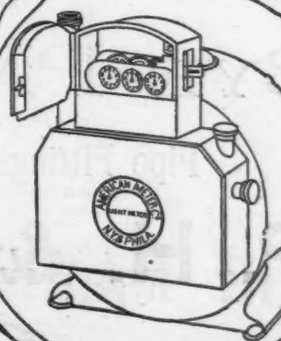

PUBLIC LIGHTING TABLE.

JULY, 1895.

Day of Week.	Table No. 1. FOLLOWING THE MOON. Date.	Light.	Extinguish.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light.	Extinguish.
				P.M.	A.M.
Mon.	1	11.50 PM	3.40 AM	7.30	3.15
Tue.	2	12.20 AM	3.40	7.30	3.15
Wed.	3	1.00	3.40	7.30	3.15
Thu.	4	1.50	3.40	7.30	3.15
Fri.	5	No L.	No L.	7.30	3.15
Sat.	6	No L. PM	No L.	7.30	3.15
Sun.	7	No L.	No L.	7.30	3.15
Mon.	8	8.00 PM	10.00 PM	7.30	3.15
Tue.	9	8.00	10.20	7.30	3.15
Wed.	10	8.00	10.50	7.30	3.15
Thu.	11	8.00	11.10	7.30	3.15
Fri.	12	8.00	11.30	7.30	3.15
Sat.	13	8.00	11.50	7.30	3.15
Sun.	14	8.00 LQ	12.10 AM	7.30	3.15
Mon.	15	8.00	12.30	7.30	3.15
Tue.	16	8.00	1.00	7.20	3.15
Wed	17	8.00	1.40	7.20	3.15
Thu.	18	8.00	3.50	7.20	3.15
Fri.	19	8.00	3.50	7.20	3.15
Sat.	20	8.00	3.50	7.20	3.15
Sun.	21	7.50 NM	3.50	7.20	3.15
Mon.	22	7.50	3.50	7.20	3.15
Tue.	23	7.50	3.50	7.20	3.15
Wed.	24	7.50	3.50	7.20	3.15
Thu.	25	7.50	3.50	7.20	3.15
Fri.	26	9.00	3.50	7.20	3.15
Sat.	27	9.20	3.50	7.20	3.15
Sun.	28	9.50 FQ	4.00	7.20	3.15
Mon.	29	10.20	4.00	7.20	3.15
Tue.	30	11.00	4.00	7.10	3.30
Wed.	31	11.50	4.00	7.10	3.30

TOTAL HOURS LIGHTING DURING 1895.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	237.00	January	423.20
February	196.40	February	355.25
March	195.50	March	355.35
April	165.30	April	298.50
May	153.40	May	264.50
June	138.20	June	234.25
July	146.30	July	243.45
August	152.50	August	280.25
September	165.10	September	321.15
October	186.10	October	374.30
November	204.10	November	401.40
December	219.30	December	433.45
Total, yr.	2161.20	Total, yr.	3987.45

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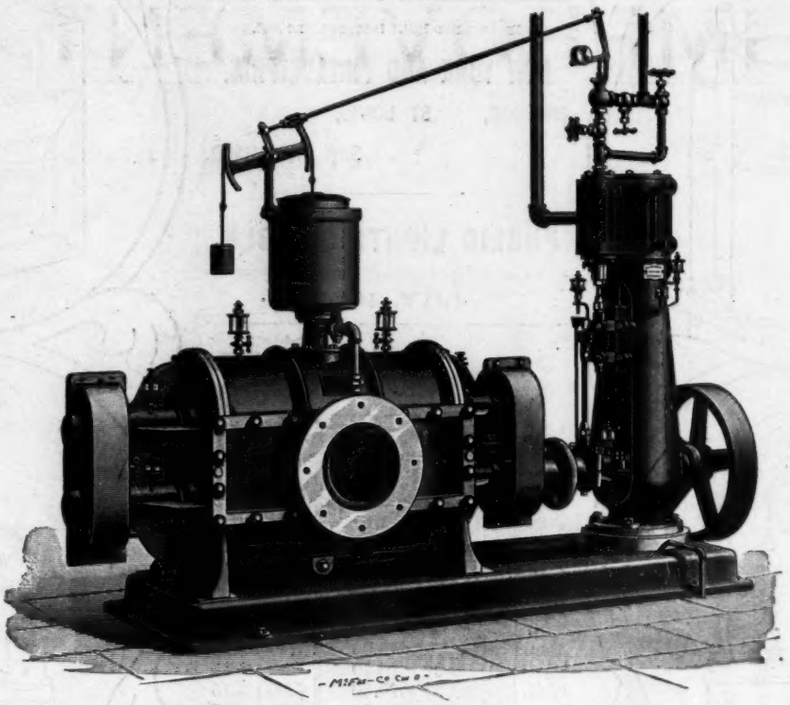
Our Latest Improved **Automatic Gas Governor** and **Steam Bye-Pass Valve** are the best in the market.



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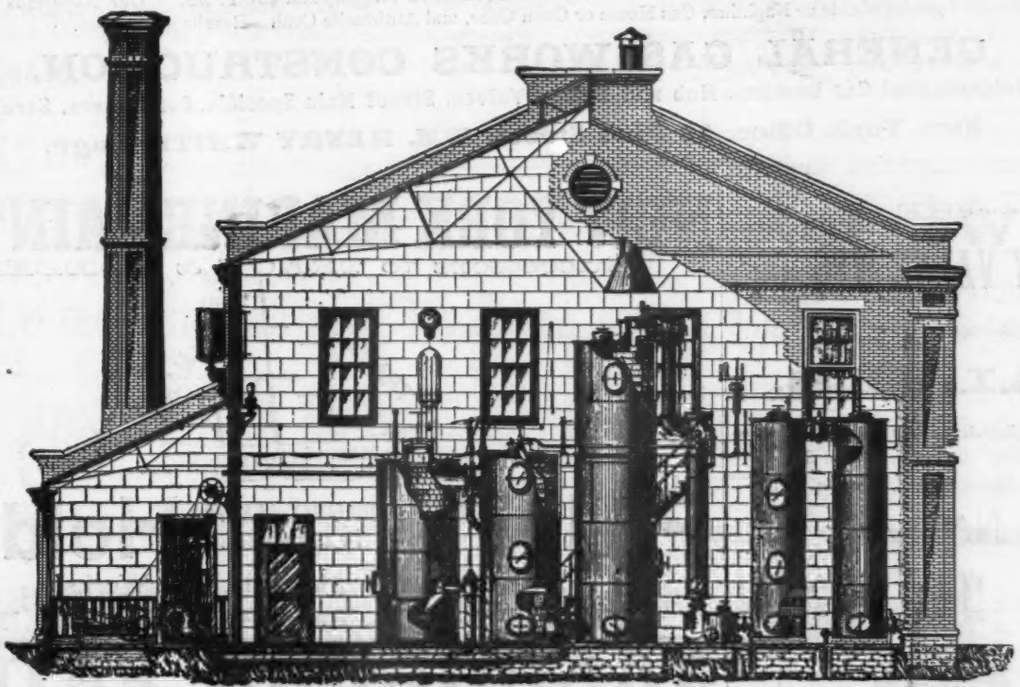

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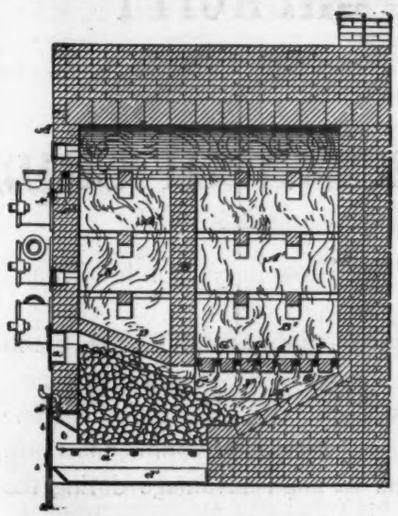

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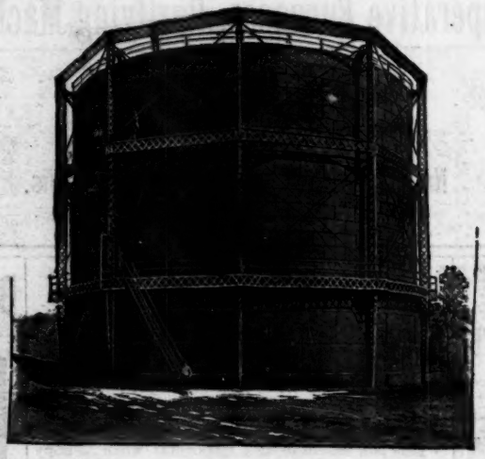

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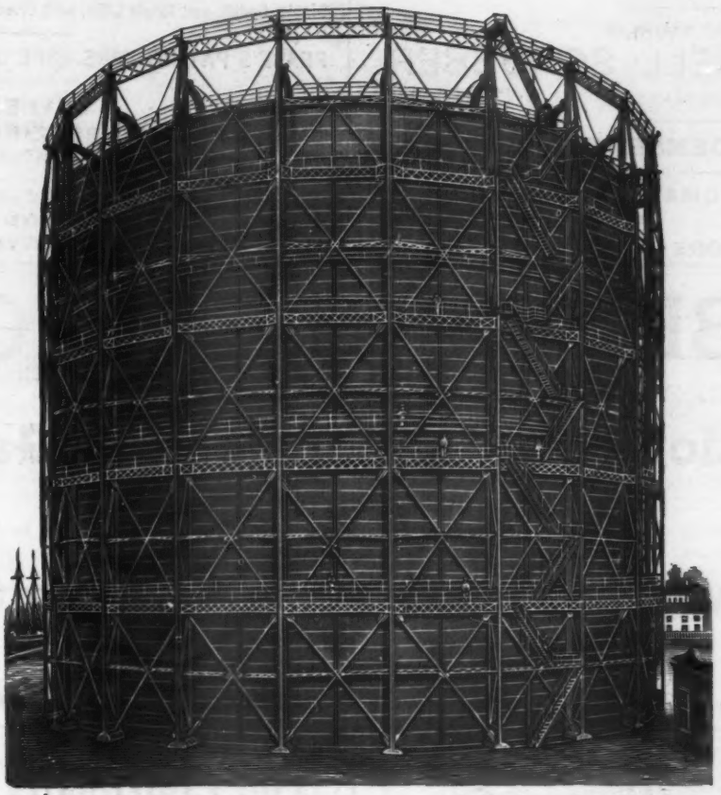

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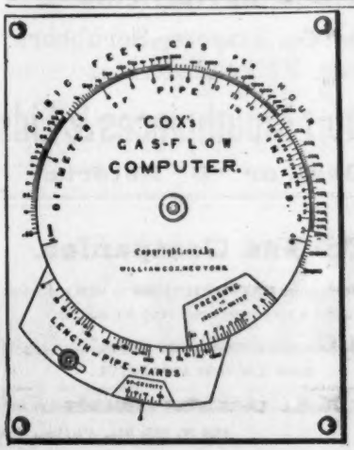

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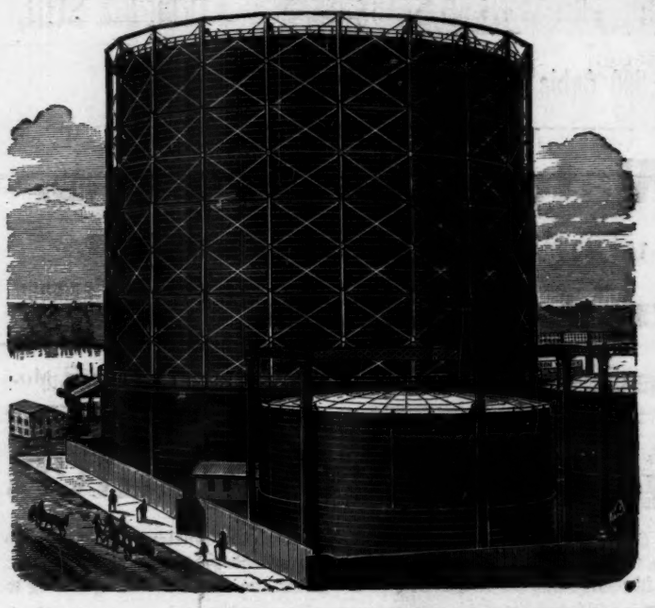

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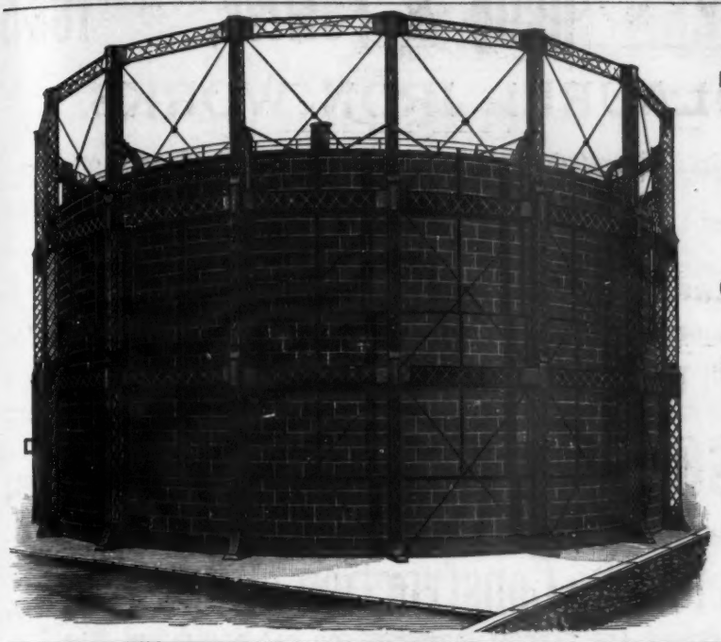

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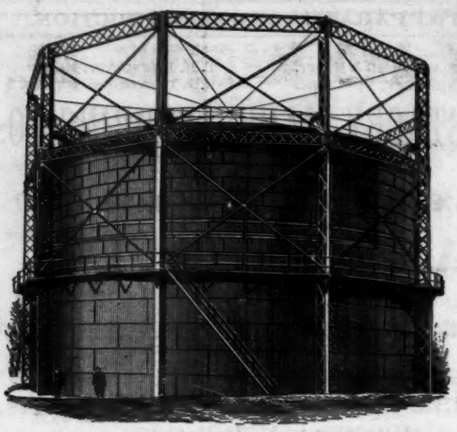

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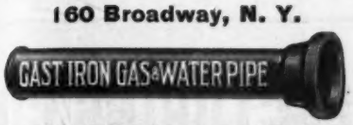

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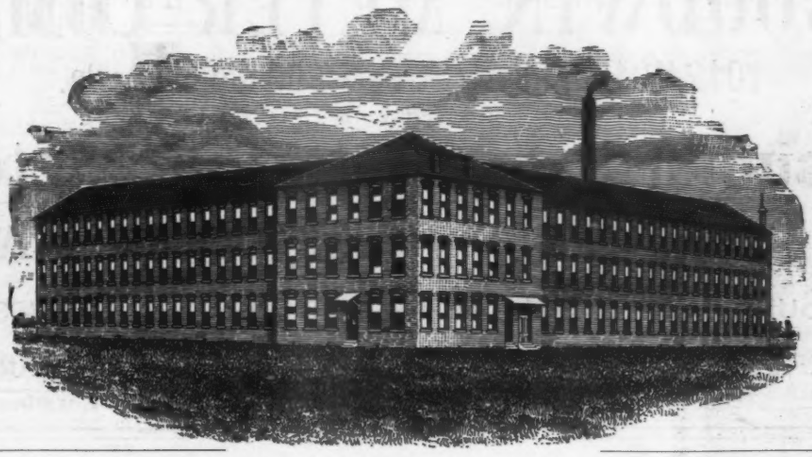

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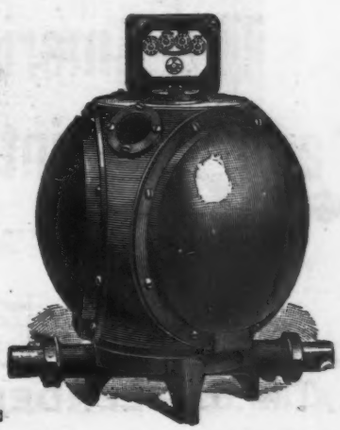

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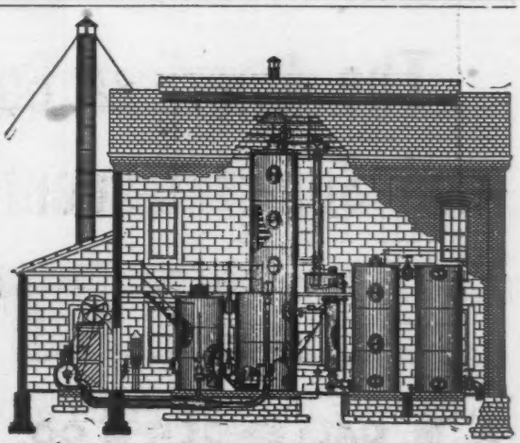

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